

UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JUNE, 1887.

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List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of June, 1887.

Name of vessel.	Captain.	Name of vessel.	Captain.	Name of vessel.	Captain.
<i>Allen Line.</i>		<i>Mallory Line.</i>		<i>Warren Line—Continued.</i>	
Br. s. s. Buenos Ayres	Capt. J. Scott.	Am. s. s. Colorado	Capt. J. Daniel.	Br. s. s. Kansas	Capt. W. Gleig.
Grecoian	C. E. Le Gallies.	Lampasas	M. B. Crowell.	Norwegian	E. Maddox.
Hibernian	J. Brown.	<i>Mediterranean & New York S. S. Co.</i>		<i>Watts Ward Line.</i>	
Promiss	J. Ambury.	Br. s. s. Pontiac	Ch. Off. R. Blyth.	Br. s. s. Chiewick	Ch. Off. J. Mayne.
Scandinavian	W. Richardson.	<i>Min. & Dominion S. S. Co.</i>		<i>White Cross Line.</i>	
American Line.		Br. s. s. Sarnia	Capt. Jos. Gibson.	Belg. s. s. De Ryter	Capt. J. J. Brarons.
Br. s. s. British King	John Kelly.	<i>Morgan Line.</i>		Pieter de Coninck	E. Smit.
British Prince	S. Nowell.	Am. s. s. Europa	R. B. Quick.	Jan Breydel	H. Meyer.
British Prince	E. H. Frooth.	<i>National Line.</i>		<i>White Star Line.</i>	
Minotaur	G. H. Dodge.	Br. s. s. Canada	Thos. Foots.	Br. s. s. Adriatic	H. Parsell.
Lord Clive	F. Urquhart.	Denmark	R. S. Rigby.	Arabia	G. Burton.
Lord Gough	E. M. Hughes.	Egypt	J. Sumner.	Baltic	H. Davidson.
<i>Anchor Line.</i>		England	T. P. Healey.	Celtic	F. J. Irving.
Br. s. s. Australia	A. McRitchie.	Erit	J. Robinson.	Germanic	Benj. Gladell.
Albatross	J. Brown.	France	A. D. Hadley.	Republic	P. J. Irving.
Alexandria	D. Port.	Greece	A. J. Jeffrey.	<i>Wilson Line.</i>	
Anchor	W. Brown.	Holvetia	G. Cochran.	Br. s. s. Bassano	W. Bea.
Bolivia	J. J. Small.	Holland	Wm. Tyson.	Buffalo	J. H. Malet.
Calcutta	A. T. Garvie.	Italy	Wm. Pearson.	Chicago	J. W. Jones.
City of Rome	B. D. Moore.	Spain	W. A. Griffiths.	Galileo	B. T. Jones.
Columbia	T. Mitchell.	The Queen	John Milligan.	Marongo	W. Abbott.
Circassia	A. Campbell.	<i>Navigazione Generale Italiana.</i>		Otranto	W. Rippeth.
Devon	Hugh Young.	Br. s. s. Gattardo	Domenico Viola.	Rialto	F. Kerr.
Dorian	J. McKeague.	Letimbro	3d Off. Fr. Diliberto.	Salerno	B. H. Rogers.
Ethiopia	John Wilson.	Marco Minghetti	Capt. L. Murtica.	Santiago	R. Potter.
Furber	J. Hedderwick.	<i>New York and Cuba Mail S. S. Co.</i>		<i>Miscellaneous.</i>	
Italy	T. Craig.	Am. s. s. Cienfuegos	F. M. Faircloth.	Nor. s. s. Amicitia	P. M. Reimers.
<i>Atter Line.</i>		N. Y. s. s. Havana & Mexican Mail S. S. Co.		Br. s. s. Aguan	J. Adair.
Br. s. s. Critic	W. R. Lord.	Am. s. s. City of Alexandria	J. W. Reynolds.	Augustine	R. Harwood.
Monte Rosa	C. Thomas.	City of Washington	W. M. Rittig.	Belair	G. Dunlop.
<i>Atlas Line.</i>		<i>North German Lloyd Steamship Co.</i>		Ben Lecl	S. Adams.
Br. s. s. Atlas	J. W. Sanson.	Ger. s. s. Aller	H. Christoffers.	Cervin	S. Hughes.
Alvina	— McKay.	Donau	H. Supner.	Chilian	E. F. Bannister.
Andes	T. M. MacKnight.	Elder	P. H. Berdrow.	Devonshire	Mate Samuel Winter.
Athena	H. Low.	Elbe	G. Meyer.	Durham City	Capt. D. D. Galbraith.
Booth's S. S. Co. (Limited).		Fids	Th. Jungst.	Earnmoor	H. J. Grey.
Br. s. s. Ambrosio	E. Eison.	Hermann	R. Ring.	Edith Godden	J. H. Bennett.
Cyril	J. H. Johnson.	Main	A. Kohlmann.	El Callao	J. Scholtz.
Jerome	Benj. Crimp.	Rhein	H. Boedcker.	Elcano	V. de Ispaña.
<i>Bordeaux Steam Navigation Co.</i>		Saale	H. Richter.	Emiliano	Don Fer. Bengoa.
Fr. s. s. Chateau Louisville	M. Le Chapelain.	Trave	H. Willigerd.	Fitzroy	Henry Gibb.
Bristol City Line.		Werra	R. Busch.	Hugo	A. de Mugica.
Br. s. s. Brooklyn City	W. Pitt.	Weser	H. Bruns.	India	M. Halsen.
Crosswell Line.		<i>Occidental and Oriental S. S. Co.</i>		Light-ship No. 37	Andrew Jackson.
Am. s. s. Hudson	H. R. Freeman.	Br. s. s. Gaelic	W. G. Pearne.	Mannet L. Villaverde	Claudio Peralas.
New Orleans	T. P. C. Halsey.	Oceanic	J. Metcalf.	Mercis	John Taylor.
<i>Conard Line.</i>		Ocean Steamship Company.		Pawnee	John James.
Br. s. s. Autania	W. H. P. Haine.	Am. s. s. City of Augusta	J. W. Catharine.	Pomona	J. Legoe.
Bothnia	T. Dutton.	Oceanic Steamship Company.		Prydain	M. Parry.
Catalonia	Edward Wylio.	Am. s. s. Alameda	G. H. Morse.	Roseville	J. Dove.
Cephalonia	Henry Walker.	Mariposa	H. M. Hayward.	Saint Roman	Henry Campbell.
Etruria	T. Cook.	Old Dominion Steamship Company.		Vertumnus	E. E. Cook.
Gallia	M. Murphy.	Am. s. s. Manhattan	Frank Stevens.	Viola	L. Murray.
Pavonia	A. McKay.	Oregon Railway and Navigation Co.		Wyo	T. L. Rogers.
Seythia	T. Roberts.	Am. s. s. Columbia	Fred Boles.	<i>New York Herald Weather Service.</i>	
Servia	H. McKay.	Oregon	E. Polmann.	Br. s. s. Alvo	D. Williams.
Umbria	W. McKickau.	<i>Pacific Mail Steamship Company.</i>		Britannic	H. Perry.
<i>Edward Carr's S. S. Line.</i>		Am. s. s. Acapulco	Chas. C. Lima.	Ger. bk. Bremerhaven	A. Witte.
Oct. s. s. Amalfi	Julius Bahr.	City of Para	L. Dexter.	Am. s. s. Caracas	N. M. Hopkins.
Australia	G. Franch.	City of Peking	H. O. Dearborn.	Fr. Chateau Lafite	C. Ollivier.
California	O. Winkler.	City of Sydney	Dan. Fricke.	Chateau Marquis	A. Seneine.
Marela	S. Mann.	Granada	J. I. Lockwood.	Chateau Yquem	Journel.
Polaris	G. Frank.	Newport	W. G. Shackford.	City of Puebla	John Deaken.
Polynia	A. Kuhn.	<i>Quebec Steamship Company.</i>		El Monte	J. W. Hawthorn.
Tacoma	W. H. Frank.	Br. s. s. Muriel	G. S. Locke.	El Paso	H. S. Quick.
<i>Fibre Line.</i>		Orinoco	J. S. Garvin.	Independente	M. Rosasco.
Fr. s. s. Neustria	F. Yerries.	Red "D" Line.		Knickerbocker	F. Bembie.
<i>Farman Line.</i>		Am. s. s. Philadelphia	Sam. Hess.	Leaving	H. Barends.
Br. s. s. Stockholm City	K. Doyle.	Valencia	W. Woodrick.	Llandaff City	F. H. Gore.
<i>General Trans-Atlantic Steamship Co.</i>		Belg. s. s. Belgenland	W. A. Beynon.	Louisiana	E. V. Gager.
Fr. s. s. La Bourgogne	E. Franguel.	Nederland	A. J. Griffin.	Marco Aurelio	H. Bernpohl.
La Bretagne	M. de Jousselin.	Noordland	H. E. Nickels.	Nevada	J. A. R. Cushing.
La Gascogne	Santelli.	Pennland	Rud. Weyer.	Niagara	S. V. Bennis.
La Normandie	G. de Kersabiec.	Rhyndland	J. C. Jamieson.	Portia	Henry Dawson.
<i>Great Western S. S. Line.</i>		Switzerland	H. Buschmann.	Rio Grande	J. T. Lewis.
Br. s. s. Dorset	Ch. Off. E. Crossman.	Vaderland	C. H. Grant.	Samsun	W. Taylor.
Oxford	Capt. W. James.	Wassland	J. Ueberweg.	Straits of Gibraltar	G. Grice.
Worcester	W. Stamper.	Westernland	Com. W. G. Bandle.	Trinidad	W. J. Fraser.
<i>Gulien Line.</i>		<i>Rattard Line.</i>		<i>Sailing vessels.</i>	
Br. s. s. Alaska	Geo. S. Murray.	Dich. s. s. Edam	Capt. J. H. Taat.	Am. bk. Alice	W. G. Kair.
Arizona	S. Brooks.	P. Caland	F. H. Bonjer.	Nor. bk. Artemis	E. E. Moe.
Wisconsin	E. Bentley.	Leerdam	G. S. Stenger.	Am. bk. Abbie Clifford	D. W. Storer.
Wyoming	C. L. Rigby.	Schiedam	A. Potjer.	Br. bk. Adria	J. H. Weldon.
<i>Humburg-American Line.</i>		Zaandam	H. v. d. Zee.	Am. bk. Arcot	J. W. Cates.
Ger. s. s. Gellert	W. Kuhlwein.	Rotterdam	G. V. Vis.	sch. C. B. Church	N. A. Anderson.
Hannovers	H. F. Schwensen.	W. A. Scholten	G. Bakker.	sch. Chas. S. Whitney	Geo. D. Spicer.
Rheinh	B. Karlowa.	<i>Royal West India Mail S. S. Co.</i>		Am. bk. Chas. R. Lewis	A. Montgomery.
Rugia	A. Albers.	Dich. s. s. Orange Nassau	J. A. J. Lacrooy.	sch. Comet	W. A. Aldrich.
Slavonia	H. Schmidt.	Royal Mail Steamship Co.		Br. sp. Cypriote	A. Robertson.
Suevia	C. Ludwig.	Am. s. s. City of Dallas	C. W. Read.	Am. bk. Daisy Boynton	C. Harding.
Wieland	C. Heblch.	State Line.		Ger. bk. Errante	N. E. Schaeffer.
<i>Imman Line.</i>		Br. s. s. State of Georgia	G. Moodie.	Am. sch. Edward B. Emerson	A. H. Child.
Br. s. s. City of Chester	A. Lewis.	State of Indiana	A. Ritchie.	Aust. bk. Fidelity	A. G. Nicolich.
City of Chicago	Fred Watkins.	State of Pennsylvania	A. J. A. Mann.	Am. sch. Florence Rogers	T. H. Schutte.
City of Richmond	A. Redford.	State of Nebraska	A. G. Brans.	Ger. sp. Georg	T. S. McLeod.
City of Montreal	R. Leitch.	State of Nevada	J. A. Stewart.	Nor. bk. Helena	G. Scholtz.
British Queen	R. Wills.	<i>Tingalla Line.</i>		Dich. bk. Hermob	S. Fajh Muns.
<i>Johnston Line.</i>		Dan. s. s. Geier	C. W. Miller.	Nor. bk. Iodine	T. T. Verbeet.
Br. s. s. Baltimore	I. Treuery.	Hekla	A. G. Thomson.	Br. bk. Josephine	O. Olsen.
Norman	John Inch.	Island	W. Skjott.	Am. bk. L. & W. Armstrong	Adam Smith.
<i>Lampert & Holt's Steamship Company.</i>		Tingalla	S. T. H. Laub.	Ger. bk. Locadia	Chas. Brown.
Br. s. s. Biela	F. Graham.	<i>Twin Sover Line.</i>		Br. sp. Mabel Taylor	A. Alexander.
Eucha	A. Matheson.	Br. s. s. Richmond Hill	A. Hyde.	bk. Madras	John Stohf.
Kepler	F. H. Tanner.	Tower Hill	F. Archer, R.N.R.	bk. Rothermay	Chas. E. Durkee.
Others	Jas. Clark.	Ludgate Hill	2d Off. H. Demarecy.	sp. Shakspeare	O. Bernier.
<i>Lopland Line.</i>		<i>Type and West Steamship Co.</i>		Br. bk. Sodas	Ch. Off. O. M. Lund.
Br. s. s. Bavarian	B. Leach.	Br. s. s. City of Newcastle	Capt. R. Townsend.	Am. bk. Stacy Clark	Capt. W. Murray.
Belgian	E. Parry.	United States and Brazil Mail S. S. Co.		Br. bk. Teresa Accuma	C. Muller.
Istria	T. H. Fox.	Am. s. s. Advance	James Lord.	Br. bk. Tillie Baker	W. Mannon.
Leo	C. J. Calnes.	Warren Line.			C. M. Haskell.
Virginian	M. Pitt.				G. Boetto.
<i>Lord Line.</i>					D. Keiffe.
Br. s. s. Bengore Head	J. R. Brady.				J. W. Carty.
Lord O'Neill	James Dunn.				

UNITED STATES SIGNAL SERVICE

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INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for June, 1887, and is based upon reports of regular and voluntary observers of both countries. Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i, on which also appears the distribution of icebergs and field ice reported. In tracing the centres of the paths of these storms, data from the reports of two hundred and twenty-one vessels have been used. Very severe weather was reported off the coast of the United States from the 12th to the 16th, and unusually strong summer gales were experienced over, and to the eastward of, the Banks of Newfoundland from the 15th to the 17th, inclusive. Dense fog prevailed in the trans-Atlantic routes during a considerable portion of the month.

On chart i for this month are traced the paths of ten areas of low pressure, which number is one more than the average for June during the last fourteen years.

The month has been decidedly warmer than the average June over the northern portions of the country from Dakota eastward to the lower lake region. In Florida, along the immediate Gulf coast, and in the northern plateau region, the mean temperature was from 2° to 4° colder than the average. In all other parts of the country the temperature differed but slightly from the June normal.

Large deficiencies in the monthly precipitation are shown over the central valleys and upper lake region, while a marked excess occurs along the Gulf and south Atlantic coasts and in Florida.

The most severe local storms of the month occurred from the 19th to 22d in the middle Atlantic states.

In the preparation of this REVIEW the following data, received up to July 20, 1887, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and twenty-two Canadian stations, as telegraphed to this office; one hundred and seventy-four monthly journals and one hundred and sixty-three monthly means from the former and twenty-two monthly means from the latter; two hundred and sixty-five monthly registers from voluntary observers; sixty monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Alabama, Dakota, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New England, New Jersey, North Carolina, Ohio, Oregon, South Carolina, and Tennessee; and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean pressure for June, 1887, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii, from which it will be seen that the pressure was greatest on the north Pacific coast, where the mean for the month at stations in Washington Territory amounted to 30.05. As in the preceding month, the region of low mean pressure embraces the Rocky Mountain districts, but the southern part extends further westward, reaching the central and southern Pacific coasts. The region of least pressure is indicated by the isobar for 29.7, which includes parts of California, Nevada, and Arizona. Over the Rocky Mountain districts and California the barometric means generally range from 29.7 to 29.9. From the one hundredth meridian eastward to the Atlantic coast there is a gradual increase of pressure from 29.9 to 30.0, or slightly above.

As compared with the mean pressure for May, deficiencies are shown over much the greater part of the country, the only exceptions being the north Pacific coast, the upper and central portions of the Mississippi valley, the Ohio Valley, Tennessee, and the east Gulf states, where there is a slight excess, generally less than .03. The deficiencies are greatest over California and the central and southern Rocky Mountain districts, where they range from .10 to .13.

The departures from the normal pressure for the various stations are given in the tables of miscellaneous meteorological data; they are also graphically exhibited on chart iv by lines connecting stations of normal or equal abnormal values. In

Washington Territory, and over the country east of the ninety-fifth meridian to the north of the thirty-fifth parallel, the mean pressure for June is above the normal; the departures are less than .05, except in the northern part of the upper lake region, in the Saint Lawrence Valley, New England, and the Canadian Maritime Provinces, where they range from .05 to .13, being greatest over Nova Scotia. In all other districts the mean pressure is below the normal. Along the Gulf coast the deficiencies range from .01 to .05; in the central and southern Rocky Mountain districts, and over the region to the north of Montana, the deficiencies range from .05 to .15.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the table of miscellaneous data. The ranges were greatest over New England, the upper lake region, northern slope, northern and middle plateau districts; they were least in the southern districts. The following are some of the extremes:

Greatest.		Least.	
	Inch.		Inch.
Fort Custer, Mont.....	1.00	Key West, Fla.....	0.27
Spokane Falls, Wash.....	0.98	Brownsville, Tex.....	0.27
Eastport, Me.....	0.87	Los Angeles, Cal.....	0.27
Alpena, Mich.....	0.85	New Orleans, La.....	0.28
Poplar River, Mont.....	0.85	San Diego, Cal.....	0.28
Boise City, Idaho.....	0.83	Rio Grande City, Tex.....	0.29
Mackinaw City, Mich.....	0.82	Corpus Christi, Tex.....	0.32

AREAS OF HIGH PRESSURE.

Five areas of high pressure were observed within, or near, the limits of the United States during the month of June, 1887. Generally they were less clearly defined than the areas of high pressure of the preceding month; they were also observed in higher latitudes, and moved with less energy. One of these areas was traced from the Pacific to the Atlantic coasts. The general direction of movement was easterly until near the Atlantic coast, where their courses changed to the southward.

I.—The month opened with areas of high pressure on the north Pacific coast and in the extreme northeast, over the Maritime Provinces. The latter area disappeared quickly to the southeast, and therefore was not enumerated as one of the principal high areas traced during the month. The high area on the north Pacific coast remained in that region during the 1st and 2d; by midnight of the latter date its centre had moved eastward to Montana, and the cold area was apparently moving southeastward over the eastern Rocky Mountain slope on the morning of the 3d. The pressure decreased within the limits of this area while it passed eastward to the upper Mississippi valley and it became greatly extended, finally disappearing to the north of the Lake region during the 4th, but was followed immediately by the appearance of high area number ii north of the Gulf of Saint Lawrence. At nearly all stations on the eastern slope of the Rocky Mountains, and at many in the Mississippi, Missouri, and Ohio valleys, the lowest temperatures of the month occurred on the 1st and 2d, during the prevalence of this area of high pressure.

II.—This area moved directly southward, causing cool easterly winds along the Atlantic coast. It was east of New England on the 6th and off Cape Hatteras on the 7th, after which it passed to the permanent high area over the north Atlantic.

III.—This area of high pressure apparently formed in the upper Missouri valley on the 7th, when it was bounded by an isobar of 30.0, inclosing portions of Dakota, Montana, and Minnesota. It moved slowly eastward north of the Lake region during the 9th and 10th, attended by increasing pressure, and, at the same time, becoming greatly enlarged. The northerly winds caused by this area of high pressure extended southward to the Gulf, and they were strong on the Atlantic coast, the maximum velocity ranging from thirty-two miles on the New England coast to forty-one on the middle Atlantic, and to forty-two at Hatteras. After reaching the upper Saint Lawrence valley it was forced to the southwestward, and on the morning of the 13th it was central in the upper Ohio valley. It then moved north and east over the Lake region and Saint Lawrence Valley on the 14th, attended by generally fair or clear weather east of the Mississippi. On the 14th the direction again changed to the southeast, the centre passing over Nova Scotia, from which point it again moved southwestward, following the coast until reaching the south Atlantic states, where it disappeared by a gradual decrease of pressure during the 16th. The minimum temperatures of the month occurred in the middle, south Atlantic, and east Gulf states between the 11th and 15th.

IV.—This area of high pressure appeared to the west of Washington Territory on the afternoon of the 15th, the previous telegraphic report indicating the advance of an area of high pressure from the Pacific. After remaining almost stationary over Oregon and Washington Territory from the 16th to the 20th, it passed to the east of the Rocky Mountains, and extended southward over the central valleys; when central over western Dakota, the barometric pressure was 30.3, and no marked changes had occurred while crossing the mountains. The flow of air southward apparently caused rapid reduction in pressure as the central area approached the Mississippi Valley, and during its transit over this region it was lost as a high area. It reappeared at the 7 a. m. report of the 25th over Pennsylvania. It was forced northwestward from the coast and passed to the vicinity of Georgian Bay, where it gathered force and passed southeastward over the middle Atlantic states to the Atlantic, disappearing on the 30th. In the Lake region and cen-

tral Ohio valley the lowest temperatures of the month occurred on the 24th and 25th.

V.—The history of this high area, in part, belongs to the succeeding month. It remained almost stationary from the 26th until the close of the month central near the coast of Oregon.

AREAS OF LOW PRESSURE.

Although ten areas of low pressure have been traced on chart i the month is notable for the absence of barometric disturbances. Only one feeble depression passed over the United States east of the Rocky Mountains. Disturbances were not observed on the Pacific coast to the west of the land during the month, while several low areas moved northward over the plateau regions, in some cases causing severe storms on the coast. A great portion of the month was marked by continued low pressure over the Rocky Mountain regions, where, during many days, the barometer ranged from .2 to .4 of an inch below the normal. These extended areas of low pressure did not possess sufficient energy to generate a defined motion of translation. The tracks of centres of two areas in this portion of the country are only approximately given, as in many cases the extended barometric troughs left uncertain the correct location of the centre.

The following table shows the latitude and longitude in which each area of low pressure was first and last observed and the average hourly velocity of each:

Areas of low pressure.	First observed.		Last observed.		Average progress in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.....	40 00	107 00	33 00	100 00	40.0
II.....	38 00	86 00	42 00	65 00	23.0
III.....	35 00	117 00	37 00	109 00	18.0
IV.....	50 00	68 00	48 00	56 00	26.0
V.....	38 00	116 00	39 00	107 00	23.0
VI.....	37 00	109 00	47 00	102 00	19.0
VII.....	53 00	70 00	50 00	58 00	25.0
VIII.....	32 00	114 00	39 00	120 00	20.0
IX.....	52 00	102 00	49 00	84 00	29.0
X.....	49 00	108 00	53 00	101 00	20.0

Mean hourly progress, 24.9 miles.

I.—This area of low pressure was apparently forced to the southeast by the area of high pressure which extended over the northern plateau region during the 1st. It was well defined at the first telegraphic report of the month but disappeared when central over northern Texas at the close of the 1st day of the month, causing no change in the weather conditions east of the Mississippi. This absence of energy and rapid disappearance was probably due to the development of low area number ii to the east of, and near, the primary low area.

II.—On chart number i it will be observed that the centre of this area of low pressure was first located in the lower Ohio valley while the storm-track extends far to southwestward. The prolongation of this storm-track is intended to indicate the probable origin of this area, although its centre was not placed to the west of Louisville. This storm was very light and although the rain area attending it included the region east of the Mississippi the amount of precipitation was generally light and local. It passed northward over the lower lakes, the course changing to easterly after reaching Georgian Bay, and then passed over New England during the 3d without causing any unusual disturbance on the coast.

III.—On the morning of the 3d the barometric pressure was low over Arizona and southern California, while at the same report an area of high pressure extended from Dakota to Idaho. This high area moved to the east, while the depression passed northward to Oregon, where it was central on the morning of the 4th. During its passage to the northward light rains occurred on the Pacific coast as far south as Los Angeles, Cal., and while passing eastward general rains occurred at the northern and central Rocky Mountain stations. Over the eastern slope of the Rocky Mountains this area of low pressure ex-

tended to the northward, forming a barometric trough which extended from the Rio Grande River to Manitoba, while a secondary disturbance apparently passed far to the north. The more clearly defined low area remained central over Colorado and disappeared without causing any change in the meteorological conditions of the regions to the east of the mountain slope. The barometric pressure remained low until the 7th, but not enough energy was developed to cause a motion of translation.

IV.—This area of low pressure was at no time central within the limits of the stations of observation. It was observed on the morning of the 8th central in the lower Saint Lawrence valley, and it passed with uniform velocity to the eastward, apparently increasing in force.

V.—As in the case of area of low pressure number iii, this area also developed in the southern plateau region, and, after moving slowly to the northeast, remained central in the Rocky Mountain region until it finally disappeared on the 10th, forty-eight hours after it was first located. When the centre reached its most northerly latitude a secondary disturbance was formed to the north of Montana, but neither of these depressions could be traced to the east of the central valleys. Number v disappeared on the 10th, when the telegraphic reports indicated that there was a slight westerly movement of the surface atmosphere in that region.

VI.—This low area developed sixteen hours after the disappearance of the area of low pressure traced as number v, only one telegraphic report separating the two areas, and they probably form a single depression. The barometer continued low over the entire Rocky Mountain region during the greater part of the month, and the tracks of the centres of these slight disturbances have been located and traced with a view of indicating in a graphic manner the prevailing areas of low pressure in the Rocky Mountain districts for the month. Number vi remained almost stationary from the 11th until the 16th, and during a greater part of this period it was a well-defined disturbance which threatened the populated districts, but it

passed northeastward over Minnesota and did not affect the weather conditions of the Lake region.

VII.—This storm was observed at midnight of the 15th moving eastward to the north of Quebec. It passed eastward with considerable energy, causing high winds in the Maritime Provinces and brisk winds, with showers, in New England on the 16th. The centre of disturbance is only approximately given for each of the tri-daily reports of the 16th. It passed over the north Atlantic, attended by dangerous gales, on the 17th.

VIII.—This slight depression was central south of Arizona on the 19th. It apparently moved in a northwesterly direction, following the mountain range of southern California. The telegraphic reports are not of sufficient number to enable one to satisfactorily trace the barometric disturbances which pass over the plateau regions. Generally during the past three months, numerous areas of low pressure have apparently originated over the southern plateau regions, and, after passing northward in rear of an area of high pressure, they pass to the east of the mountain range and influence the weather conditions of the Atlantic.

IX.—This is the only depression of the month observed as first central in the region north of Montana. Although traced to the eastward north of the Lake region this storm did not develop sufficient energy to cause marked changes in the weather of the United States. It moved eastward with almost uniform velocity until it reached longitude 78° W., where it apparently retreated or remained nearly stationary, while its area became more extended. When this area of low pressure was central north of the Lake region general rains occurred southward to the Ohio Valley, and fresh to brisk westerly winds were reported from the lake stations.

X.—This area of low pressure probably originated over Nevada, but is first noted as central in Montana on the morning of the 26th. It moved to the northeast from Montana and passed beyond the stations of observation during the 27th, it being last observed far to the north of Minnesota.

NORTH ATLANTIC STORMS DURING JUNE, 1887.

[Pressure in inches and millimetres; wind-force by Beaufort scale.]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" and from other miscellaneous data received at this office up to July 21, 1887.

Thirteen depressions are traced, of which one traversed the ocean from coast to coast; two appeared to the northward of the West Indies; two passed eastward over Newfoundland; one apparently originated southwest of the British Isles and moved northward, and eight developed over mid-ocean. The general direction of movement of these depressions was east-northeast to the eastward of the thirtieth meridian, while to the westward of that longitude their course of direction was diversified.

With the exception of rather strong summer gales to the westward of the twenty-fifth meridian during the second decade of the month, the general character of the weather over the north Atlantic Ocean was settled and seasonable. From the 12th to the 16th strong north to east winds were reported in the Gulf Stream south of the fortieth parallel; from the 14th to the 17th, inclusive, the severest weather of the month prevailed to the eastward and southward of Newfoundland; on the 24th moderate to strong gales were encountered over mid-ocean, and on the 29th fresh gales were experienced to the southward of the Banks. The lowest barometer reading re-

ported in the trans-Atlantic routes was 29.30 (744.2), on the 15th, in N. $42^{\circ} 53'$, W. $57^{\circ} 31'$. During the second and third decades of the month the barometer was almost continuously high over the eastern portion of the ocean south of the fifty-fifth parallel; to the southward of the fortieth parallel high pressure prevailed, except off the coast of the United States from the 10th to the 16th, and in the vicinity of the Azores from the 22d to the 25th, inclusive.

In June, 1886, fourteen depressions were traced, of which one was traced across the ocean; five were continuations of areas of low pressure traced on the North American continent; four originated over the ocean east of the thirty-sixth meridian, and four developed between the coast of North America and the forty-second meridian. Two very violent and destructive cyclones moved from the Caribbean Sea into the Gulf of Mexico; the remaining depressions traced were, as a rule, of slight depth, and their passage was unaccompanied by atmospheric disturbances of unusual violence.

As compared with the corresponding month of previous years, the depressions which appeared during June, 1887, were possessed of the average summer strength, and while no tropical storms appeared over the Caribbean Sea their absence during this month is not unusual.

The following are brief descriptions of the depressions traced:

1.—The presence of this storm off the southwest extremity of Ireland was shown by reports of the 1st; by the 2d the centre of disturbance had moved north, after which it disappeared beyond the region of observation. This depression had baro-

metric pressure ranging to about 29.60 (751.8), and occasional gales of but moderate strength.

2.—This depression appeared over mid-ocean on the 1st, with central pressure about 29.60 (751.8), and moderate to fresh gales, and moved slowly north of east to the southwestward of the British Isles by the 3d, after which it was drawn northward by depression number 3.

3.—This storm was central on the 1st in about N. 58°, W. 36°, whence it moved slowly northeast to the thirtieth meridian, after which it passed beyond the region of observation.

4.—This depression appeared over mid-ocean on the 3d, with pressure ranging to about 29.40 (746.7), and, circling northwest, united with depression number 5 on the 4th.

5.—This depression is first charted in N. 53°, W. 41°, under date of the 4th, whence it had apparently advanced from the westward; moving east-northeast this storm disappeared to the northward of the British Isles after the 7th. While the course of this storm was too far to the northward to be severely felt in the trans-Atlantic routes, it possessed considerable energy and had barometric pressure ranging to about 29.40 (746.7) on the 4th.

6.—This depression appeared northeast of the Banks of Newfoundland on the 8th, with central pressure about 29.50 (749.3), and, moving northward, passed beyond the region of observation after the 9th.

7.—This depression advanced over the southeastern portion of Newfoundland during the 9th, and, moving rapidly east-northeast, disappeared to the northward of the British Isles during the 12th, with a moderate display of energy throughout.

8.—This depression moved slowly southward off the middle Atlantic coast of the United States during the 10th and 11th, accompanied by moderate to fresh gales, and thence passed northeast along the Gulf Stream to mid-ocean by the 15th, where it disappeared. The storm had greatest strength during the 15th when pressure 29.30 (744.2) was reported.

The following special reports have been made relative to this depression:

Capt. J. H. Bennett, of the s. s. "Edith Godden," reports: "12th, in N. 38° 10', W. 74° 15'; 1 p. m., barometer 29.98 (761.5), wind nne., force 6, moderate northerly sea and heavy easterly swell, weather fine; 5 p. m., barometer 29.90 (759.4), wind nne., force 6, heavy nne. sea., very heavy e. by n. swell; 10 p. m., barometer 29.86 (758.4), wind n. by e., force 7, heavy n. by e. sea, very heavy ene. swell, weather threatening. 13th, 3 a. m., barometer 29.72 (754.9), wind n., force 9, very heavy n. sea and ne. by e. swell, steering south, hauled ship's head to the wsw.; 9 a. m., in N. 35° 04', W. 75° 10', barometer 29.78 (756.4), wind n. by w., force 7, less sea and losing the heavy ne. swell, sky covered with scud travelling very fast from n. by w.; noon, less wind and sea, sky clearing."

Capt. H. Campbell, of the s. s. "Saint Ronans," reports a strong gale, commencing from the s. at 6 p. m. of the 14th (in N. 47° 22', W. 37° 01', at noon) and ending from the nnw. at noon of the 15th, in N. 46° 08', W. 41° 23'. The wind veered to sw. and w. in a. m. of the 15th, and was accompanied throughout by very heavy ssw. seas. Capt. Hugh Young, of the s. s. "Devonia," reports a fresh gale on the 14th and 15th; wind backed from sw. to s.; lowest barometer, 29.30 (744.2), at 4 a. m. of the 15th, in N. 42° 53', W. 57° 31'. Capt. James Scott, of the s. s. "Buenos Ayrean," reports a fresh gale on the 15th; wind veered from ssw. to nw. at 6.30 p. m.; lowest barometer, 29.50 (749.3), at 6 p. m., in N. 53° 26', W. 30° 06'. Capt. W. Stamper, of the s. s. "Worcester," reports a strong gale on the 15th; wind veered from s. to n.; lowest barometer, 29.38 (746.2), at 6 p. m., in N. 49° 00', W. 32° 00'.

9.—This depression first appeared on the 14th in the sub-tropical region north of the West Indies, and, circling slowly east of north, disappeared after the 16th. The depression was of slight depth, but, in conjunction with depression number 8, occasioned very unsettled weather off the middle and south Atlantic coasts of the United States from the 12th to the 16th, as is shown by the following report: Capt. Frank Stevens, of

the s. s. "Manhattan," reports strong ne. to nne. winds from the 12th to the 16th, during passage from Havana to Winter Quarter Light-ship; also had very heavy confused seas and had to haul in out of the Gulf Stream to get smoother water, as the sea was very high and the vessel shipped much water. He further reports this as being the roughest passage he has experienced in seventeen months.

10.—This depression passed east-northeast over Newfoundland during the 17th, and disappeared over mid-ocean in about N. 51° after the 19th. This storm displayed considerable energy prior to the 19th, and was accompanied by fresh to strong gales and heavy rain.

The following special reports refer to this depression:

Capt. A. J. A. Mann, of the s. s. "State of Pennsylvania," reports: "17th, at about 2 h. 50 m., experienced the beginning of an unusually strong summer gale from the southward, barometer being then 29.92 (760.0) and falling, and position, N. 50° 12', W. 42° 00'; wind freshened to whole gale by 8 h. 50 m., and by 11 h. it blew very strong, with fierce squalls, rain, and heavy sea; 14 h., gale began to abate, but still very squally, with heavy, constant rain, and black weather; 17 h. 30 m., barometer at lowest, 29.44 (747.8), wind and sea abating, position, N. 49° 25', W. 44° 15'; after this the gale continued to moderate and the barometer commenced to rise."

Capt. W. Rea, of the s. s. "Bassano," reports a fresh gale on the 16th and 17th; wind veered from sse. to wsw.; lowest barometer, 29.73 (755.1), at 8 p. m. of the 17th, in N. 39° 44', W. 53° 49'. Capt. James Scott, of the s. s. "Buenos Ayrean," reports a strong gale on the 17th and 18th; wind veered from s. to w.; lowest barometer, 29.60 (751.8), at 2 p. m. of the 18th, in N. 49° 30', W. 42° 35'. Mr. H. H. Herbert, observer on the s. s. "Worcester," Capt. W. Stamper, commanding, reports: "17th, in N. 47° 20', W. 39° 00, at noon, hard sw. gale, with torrents of rain and heavy sw. sea till 8 a. m. of the 18th, in N. 45° 30', W. 41° 00, when the barometer read 29.57 (751.1). Wind continued sw., following the gale, with thick fog."

11.—This depression moved southeast over mid-ocean during the 21st and 22d, without evidence of marked energy, and disappeared to the northward of the Azores.

12.—This depression appeared over the ocean to the northward of the Azores on the 24th, after which it apparently dispersed. Although short-lived, this storm possessed considerable strength and had barometric pressure ranging to about 29.50 (749.3).

The following reports have been rendered relative to this depression: Capt. C. A. Murray, of the s. s. "Albano," reports a moderate gale on the 23d and 24th; wind veered from n. to se.; lowest barometer, 29.73 (755.1), at noon of the 24th, in N. 48° 9', W. 32° 30'. The sea broke over the ship during this storm, causing considerable damage. Capt. R. Potter, of the s. s. "Santiago," reports a strong gale on the 24th and 25th; wind veered from nne. to e.; lowest barometer, 29.54 (750.3), at 6 p. m. of the 24th, in N. 46° 30', W. 36° 30'. The gale was attended by high seas and blew strongest from nne. from 4 p. m. to midnight of the 24th.

13.—This depression passed northeast from the Banks of Newfoundland during the 28th, and disappeared north of the fifty-fifth parallel after the 29th, with moderate to fresh gales, rain, and pressure ranging to about 29.70 (754.4).

OCEAN ICE.

On chart i are also exhibited the limits within which icebergs and field ice were reported during June, 1887. These limits are determined from reports furnished by shipmasters, and from data collected by the Signal Service agencies.

The easternmost ice was passed on the 20th, in N. 43° 22', W. 39° 19', by the s. s. "Nessmore," and the southernmost ice reported was observed on the 15th, in N. 40° 40', W. 48° 34', from the s. s. "City of Montreal."

Ice was most frequently encountered during the month from the coast of Newfoundland, between Saint John's and Cape Race, south-southeast to the forty-first parallel; from the New-

foundland coast, south of the forty-ninth parallel, eastward to the forty-fourth meridian, ice was encountered in large quantities throughout the month.

As compared with ice reported during May, 1887, there has been a total disappearance of field ice and icebergs to the westward of the fifty-fifth meridian; the chart for May showing considerable ice in the vicinity of Cape Breton and south of Newfoundland. The extreme limits of ice are about seven degrees further east and about one degree further north than in May, and there has been a decided increase in the quantity of ice reported to the eastward of Newfoundland, which fact is due to vessels following a more northerly route.

As compared with June, 1886, the eastern and southern limits are about the same, while the quantities of ice reported off the southern coast of Newfoundland and northward to Labrador in 1886 do not appear on the chart for June, 1887.

As compared with the corresponding month of previous years the southward movement of ice massed to the northward of Newfoundland and off the coast of Labrador has been greatly delayed, and advices fail to show that vessels passed through the Straits of Belle Isle, although this route has usually been available early in June.

The following table shows the southern and eastern limits of the region within which ice was reported for June during the last five years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
June, 1883	40 28	51 45	June, 1883	48 14	42 43
June, 1884	40 42	47 49	June, 1884	44 00	45 23
June, 1885	39 38	48 12	June, 1885	45 14	41 12
June, 1886	40 30	53 00	June, 1886	49 15	40 00
June, 1887	40 40	48 34	June, 1887	43 22	39 19

Icebergs and field ice were reported as follows:

Date.	Vessels.	Position. Lat. N. Lon. W.	Remarks.
1	S. S. Indian Prince	42 24 51 06	Two large bergs.
2	S. S. Hermann	43 12 49 02	One berg.
3	S. S. Alaska	42 57 49 30	One medium berg.
3	S. S. La Normandie	42 53 49 47	Do.
3	S. S. Nova Scotian	Between St. John's and Cape Race.	Several large bergs.
3	S. S. Dakota	42 57 49 30	One berg.
3	S. S. Dorset	47 20 48 20	Three bergs.
3	Bk. Jupiter	43 20 45 30	One berg.
3	S. S. Elder	43 46 45 19	Do.
3	S. S. Dorset	42 44 49 51	Do.
3	S. S. Dorset	46 30 51 05	Do.
3	S. S. Brooklyn City	45 44 47 04	One medium berg.
3	S. S. Proclia	42 38 49 07	One berg.
3, 4, 5	Bk. Adolph	42 45 47 54	Five bergs; one very large.
4	S. S. State of Indiana	42 39 48 58	One large and four small.
4	S. S. Amalfi	43 20 49 42	One large berg.
4	S. S. Amalfi	43 24 50 02	Do.
4	S. S. Amalfi	43 05 49 10	Do.
4	S. S. Amalfi	42 06 50 24	Do.
4	S. S. Amalfi	42 13 48 59	One medium berg.
4	S. S. Norseman	42 50 49 00	One berg.
4	S. S. Hekla	44 00 46 00	One berg and small ice.
4	S. S. Aller	42 00 50 21	One large berg.
4	S. S. Hekla	42 09 49 05	Do.
4	S. S. Hekla	43 50 46 00	(broken ice.)
4	S. S. Scythia	43 46 46 48	One berg and extensive fields of
4	S. S. Scythia	43 39 46 51	One berg.
4	S. S. Scythia	43 39 46 51	Do.
4	S. S. Scythia	46 00 54 10 52	Several bergs.
4	S. S. Scythia	43 50 45 30	One medium berg.
4	S. S. Scythia	42 24 49 41	One berg.
4	S. S. Scythia	42 16 50 23	Do.
4	S. S. Scythia	45 30 48 40	Do.
4	S. S. Florida	42 00 49 00	Two large bergs.
4	S. S. Ivigtut	46 00 51 00	One very large berg.
4	S. S. Anchoria	44 49 47 44	One large berg.
4	S. S. Servia	42 28 48 05	One small berg.
4	S. S. Ripon City	46 23 48 35	Three large bergs.
4	Bk. Sodium	48 35 51 40	Numerous bergs.
4	S. S. State of Nebraska	46 27 48 24	One large berg and pieces.
4	S. S. State of Nebraska	46 18 48 36	One very large berg.
4	S. S. State of Nebraska	45 26 51 00	One medium berg.
4	Bk. Sodium	46 30 52 30	One large berg.
4	S. S. Adriatic	42 54 46 53	Do.
4	S. S. Grecian	9 miles east of Cape Race.	Two large bergs.
4	S. S. Grecian	35 miles east of Cape Race.	Three large bergs.
4	S. S. Grecian	47 12 51 25	Two large bergs and ice.
4	S. S. Grecian	47 45 49 50	One large berg.

Icebergs and field ice—Continued.

Date.	Vessel.	Position. Lat. N. Lon. W.	Remarks.
13	S. S. W. A. Scholten	41 12 48 29	One berg.
13	S. S. Kate Fawcett	45 36 50 14	One small berg.
13, 14	S. S. Venetian	48 00 48 30	Several bergs.
13, 14	Bk. Sodium	49 00 44 30	Do.
13, 14	S. S. Sarnia	Cape Race 30 miles n. by w. 1/4 w.	Two large bergs.
13, 14	S. S. Sarnia	30 miles sw. Cape Race.	Three bergs.
13, 14	S. S. Gellert	41 04 49 59	One berg.
13, 14	S. S. Anchoria	41 21 48 24	One large berg.
13, 14	S. S. Bengore Head	45 53 44 27	Do.
14	S. S. Bengore Head	54° e., 80 miles n. from Cape Race, to Cape Race.	Two large and several smaller bergs.
14	S. S. Saale	42 57 49 31	One berg.
14	S. S. Monte Rosa	46 00 52 50	Two very large bergs.
14	S. S. Peruvian	48 06 50 30	One large berg.
15	S. S. Main	47 00 44 00	Large bergs.
15	S. S. City of Montreal	48 00 44 00	One large berg.
15	S. S. Bengore Head	40 40 48 34	Three bergs.
15	S. S. Bengore Head	Off Cape Race, Cape Race bearing n. 54° e., 80 miles.	Two large bergs.
15	S. S. Elder	46 16 48 25	One large berg.
15	S. S. City of Chester	40 56 47 57	One small berg.
15	S. S. Devonia	44 20 48 30	One large berg.
15	S. S. Saint Bonans	44 10 48 13	Do.
15	S. S. Main	46 26 47 57	One berg.
15	S. S. Main	46 04 48 35	Do.
15	S. S. La Bourgogne	44 32 49 10	Do.
15	S. S. Samarian	Off Cape Race.	Eight bergs and loose ice.
15	S. S. Austrian	47 38 50 35	One large berg.
15	Bk. Francis Herbert	42 57 49 28	One medium berg.
15	S. S. Jan Breydel	43 39 44 20	One large berg.
15	S. S. Austrian	46 42 52 26	Do.
17	S. S. Austrian	47 23 51 13	Do.
18	S. S. Palestine	42 40 50 08	Three large pieces of ice.
18	S. S. Trave	46 03 48 40	One medium berg.
18	S. S. Buenos Ayres	48 00 49 20	Several bergs and small pieces.
18	S. S. Buenos Ayres	to Cape Race.	
18	S. S. De Ruyter	47 02 45 04	One large berg.
18	S. S. Trave	47 08 44 53	One medium berg.
20	S. S. De Ruyter	46 13 48 38	One large berg.
20	S. S. State of Alabama	47 08 44 48	Do.
20	S. S. Jersey City	45 10 47 50	Do.
20	S. S. Hay Green	47 10 45 40	Do.
20	S. S. Hay Green	30 miles south of the Banks.	Two enormous bergs.
20	S. S. Nessmore	43 22 39 19	One piece of ice.
21	S. S. State of Alabama	45 57 48 29	One large berg.
22	S. S. City of Chester	41 00 47 00	Small bergs.
22	S. S. City of Chester	41 30 49 00	Do.
22	S. S. City of Chester	47 34 50 00	Cape Race, five bergs.
23	S. S. La Gascogne	47 12 51 15	One medium berg.
23	S. S. La Gascogne	47 10 51 20	One large berg.
23	S. S. Crystal	46 48 52 40	One medium berg.
23	S. S. Roman	44 45 48 50	Do.
25	S. S. Roman	44 25 48 38	Three small bergs and pieces.
25	do	5 miles off Cape Race.	Five bergs.
25	S. S. Mineola	43 30 50 05	One medium berg.
25	S. S. Egypt	45 49 48 53	One berg low in water.
25	S. S. Egypt	45 58 48 18	One small berg.
25	S. S. Mineola	43 24 46 59	One large berg.
25	Bk. Jupiter	44 44 48 38	Do.
25	S. S. Circassia	46 11 48 42	One medium berg.
30	S. S. Circassia	45 48 49 35	Do.
30	S. S. Scandinavian	47 10 45 15	One large berg.
30	S. S. Scandinavian	45 52 48 36	One berg.
30	S. S. Scandinavian	45 50 49 08	Do.

FOG.

The following reports show that fog was encountered in the vicinity of the Banks of Newfoundland on fourteen dates; to the westward of the sixtieth meridian on seventeen dates, and to the eastward of the Banks on fifteen dates. In each of the instances in which fog was observed in the vicinity of the Banks, save on the 25th, 26th, and 27th, the reporting vessel was located in the southern or eastern quadrant of an area of low barometric pressure, and on the excepted dates the winds were variable and marked ranges in temperature were shown in that region. To the westward of the sixtieth meridian fog developed within high barometer areas which succeeded the passage of areas of low pressure, and during the middle portion of the month originated to the northward of low barometer areas which occupied the ocean south of the fortieth parallel. As regards fog reported in the trans-Atlantic routes east of the Banks of Newfoundland, its presence was generally noted in the southeast quadrant of a storm-area or along the northern or northwestern margin of an area of high barometric pressure. In all cases the prevalence of fog was shown to be due to abnormal atmospheric conditions attending

the approach or passage to the eastward of cyclonic areas, whereby masses of air exhibiting large ranges in temperature were drawn into the localities where the fog banks were encountered.

The following are the limits of fog-areas on the north Atlantic Ocean during June, 1887, as reported by shipmasters:

Date.	Vessel.	Entered.			Cleared.		
		Lat. N.	Lon. W.	Time.	Lat. N.	Lon. W.	Time.
1	S. S. Scythia	31 48	8 00		31 46	8 15	
1	S. S. British Prince	40 59	47 22		40 51	47 42	
2	S. S. La Normandie	42 50	50 05		42 49	52 10	
2	S. S. Canada	41 06	65 30		40 45	68 00	
2	S. S. Ems	41 00	65 55		40 30	71 30	
2-3	S. S. Amicitia				40 26	70 49	
3	S. S. Canada	40 54	69 00		40 26	70 00	
3	S. S. Umbria	41 58	62 00		41 37	64 00	
3	S. S. Stockholm City	42 35	65 50				Till port.
3	S. S. Pennland	40 27	79 40		40 26	72 00	
3	S. S. Edith Godden	38 41	74 23				Sandy Hook.
3	S. S. State of Indiana			Off Shore			Sandy Hook.
3	S. S. La Normandie	42 45	57 30		42 42	61 05	
3-9	Brig. Arcot	43 28	69 12		44 12	67 41	
9	S. S. Nekla	41 00	66 30		40 30	71 00	
9	S. S. City of Richmond	41 03	65 45		41 01	67 19	
9	S. S. Scythia	42 27	64 15		42 30	66 15	
9	S. S. Trave	41 09	66 14		40 42	70 44	
9	S. S. Ems	40 20	64 35		40 03	68 20	
9	S. S. Scandinavian	42 30	54 02	8 p. m.	42 23	53 22	
9-10	Schr. C. B. Church	40 08	72 47		41 00	71 30	
11	S. S. Aurania	49 50	20 45		50 40	16 15	At inter-vals.
12	S. S. Saint Ronans	49 27	24 33		42 20	25 00	
12	S. S. Letimbro	35 00	10 38		35 56	10 50	
13	S. S. Wyoming	41 50	60 00		41 44	60 40	
13	S. S. Sarnia	46 32	52 50		48 06	47 51	
13	S. S. Rotterdam	48 31	16 51				Lasted one hour.
13	S. S. Vatterland	39 39	64 05		39 42	63 41	
14	S. S. Seale	43 49	40 20		42 37	51 26	
14	S. S. Rotterdam	49 06	13 32				Lasted two hours.
14-15	S. S. Ems	49 30	17 45		49 34	17 30	
15	S. S. Sarmatian			St. Pierre Island; detained three hours.			
17	S. S. Trave	43 34	57 03		43 56	55 36	
17	S. S. Elbe	42 44	45 55		42 41	46 13	
17	S. S. Saint Ronans	44 03	50 27		43 37	53 00	
17	S. S. Main	44 59	52 40		44 00	56 21	
17	S. S. Devonian	43 27	49 46		42 49	52 43	
17-18	S. S. Palestine	43 55	48 00		43 40	50 10	
18	S. S. Elbe	43 40	46 04		43 08	50 04	
18	S. S. Taormina	41 55	46 00		41 00	49 15	
18	S. S. Worcester	44 30	42 00		43 33	45 05	
18-19	S. S. Pennland	40 28	72 40		40 09	70 11	
18-20	S. S. Saint Ronans	40 26	73 51		41 15	62 54	
18-20	S. S. Geiser	47 12	37 55		43 32	43 11	
18-21	S. S. Buffalo	44 00	40 15		40 58	35 45	At inter-vals.
18-24	S. S. Denmark	43 29	39 42		40 41	69 48	do.

Limits of fog areas—Continued.

Date.	Vessel.	Entered.			Cleared.		
		Lat. N.	Lon. W.	Time.	Lat. N.	Lon. W.	Time.
19	S. S. Trave	47 10	44 43		47 50	42 31	
19	S. S. De Ruyter	47 47	42 08		47 34	43 32	
19	S. S. City of Richmond	40 30	72 00		40 37	68 58	
19-20	S. S. Amicitia	40 10	70 05		41 53	69 52	
19-21	S. S. Pavonia	47 00	36 45	6 a. m.	42 13	51 50	9 p. m., at intervals.
20	S. S. City of Richmond	40 36	60 02		40 36	59 35	
20	S. S. Main	38 26	71 27		38 14	71 56	
20	S. S. Saint Ronans	40 56	68 19		40 31	71 29	
20-21	S. S. Elbe	40 43	67 06		40 23	71 01	
20-22	S. S. Bassano	40 00	66 00		40 27	71 48	
20	S. S. Devonian	40 49	69 19		40 24	73 02	
20	S. S. Aurania	51 16	12 30		51 04	16 40	
20	S. S. Prydian	50 21	12 30		50 21	17 50	
20	S. S. Italy	41 20	47 37		41 24	45 57	
20	S. S. Servia	41 31	55 39		41 34	55 02	
21	S. S. Servia	41 39	53 59		41 42	53 22	
21	S. S. Elbe	40 23	71 26		40 24	73 13	
21	S. S. Saint Ronans	40 29	73 00		40 27	73 23	
21-22	S. S. Palestine	42 22	68 30				Boston
21-22	S. S. Austria	42 40	68 00				Boston
22	S. S. Taormina	40 54	66 34		40 47	68 04	
22	S. S. Aurania	49 46	28 47		47 20	38 00	At inter-vals.
22-23	S. S. De Ruyter	42 25	63 20		41 38	66 03	
23	S. S. Worcester	41 24	63 00		41 20	66 00	
23	S. S. Amicitia	41 52	69 55		40 46	69 24	
23-24	S. S. Pavonia	42 17	61 58	6 a. m.			Boston p. m., at intervals
23-24	S. S. State of Alabama	43 15	61 20	10 a. m.	42 40	67 40	7 p. m.
23-26	Brig. Arcot	44 36	66 59		44 28	67 23	
24	S. S. Worcester	40 36	69 00		40 26	71 00	
24	S. S. Geiser	40 56	68 26		40 30	70 08	
24	S. S. Gallia	40 30	73 21		40 30	72 06	
25	S. S. Aurania	41 24	64 00		41 00	67 20	At inter-vals.
25	S. S. Scandinavian	52 49	16 03	3 30 p. m.	52 42	18 01	
25	S. S. Gallia	40 33	67 47		40 33	66 11	
25-26	S. S. Celtic	41 44	51 26	8 50 a. m.	41 57	48 55	11 30 p. m.
26	S. S. Scandinavian	52 40	18 29	4 30 a. m.	52 35	19 44	
26	S. S. Ems	49 50	27 10		49 48	27 35	
26-27	S. S. Schiedam	46 45	45 18		44 45	50 20	
27	S. S. Ems	49 02	34 02		48 54	35 12	
27	S. S. Prydian	43 26	47 10		41 56	52 00	
27	S. S. Umbria	49 53	27 18		49 32	28 38	
27	S. S. Circassia	52 20	32 49		52 01	34 08	
27	S. S. Eider	49 51	5 48		49 42	6 56	
27-28	S. S. Albano	42 30	47 00		41 47	49 00	Noon.
27-28	S. S. Scandinavian	51 27	29 12		50 10	35 35	
28	S. S. Gallia	42 22	45 31		43 00	40 09	
29	S. S. Island	56 50	21 15		56 02	25 30	
29	S. S. Schiedam	41 07	67 30		41 00	68 10	
30	S. S. Istrian	45 00	46 40	7 p. m.	43 26	50 30	9 15 a. m.
30	S. S. Sarnia	53 29	49 00		52 57	50 48	

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for June, 1887, is exhibited on chart ii by the dotted isothermal lines. In the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service, and the figures opposite the names of the geographical districts in the column for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean for the district when the departure is below the normal, and subtracting when above. On chart iv the departures from the normal are illustrated by lines connecting stations of normal or equal abnormal values.

Along the Atlantic and Gulf coasts, in the north Pacific coast region and northern plateau, the mean temperature for June, 1887, is below the normal; the deficiencies in these districts are very slight (generally less than 2°) except in Florida, along the immediate west Gulf coast, and over the northern plateau, where they range from 2° to 4°. Over the southern Rocky Mountain region and the northern districts from Montana, Wyoming, and Colorado eastward to New England, the mean temperatures are above the normal from 2° to 4°.

The following are some of the most marked departures from the normal temperature at Signal Service stations:

Above normal.	Below normal.
Fort Sully, Dak..... 6.6	Key West, Fla..... 4.7
Fort Apache, Ariz..... 4.9	Sanford, Fla..... 4.4
Fort Bridger, Wyo..... 4.2	Spokane Falls, Wash..... 3.8
Moorhead, Minn..... 4.1	Fort Assinaboine, Mont..... 3.7
Huron, Dak..... 3.9	Rio Grande City, Tex..... 3.6
Bismarck, Dak..... 3.5	Brownsville, Tex..... 3.2
Prescott, Ariz..... 3.5	Boise City, Idaho..... 3.2
Deadwood, Dak..... 3.4	Fort Maginnis, Mont..... 2.7

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of temperature, are given in the table of miscellaneous meteorological data.

The monthly ranges were greatest in the Rocky Mountain regions and upper Missouri valley, where numerous stations report from 60° to 68°, Winnemucca, Nev., and Phoenix, Ariz., reporting the maximum range, 68°. The Gulf coast stations show the least monthly ranges (generally below 30°), that at Key West, Fla., being the least, 18°, while Galveston, Tex., reports a monthly range of but 19°.

The greatest daily ranges of temperature exceeded 40° over the greater portion of the Rocky Mountain region, and at a majority of the stations occurred from the 16th to 20th. On the Pacific coast, over the central valleys, Lake region, and in the Atlantic coast districts the greatest daily ranges were generally from 20° to 36°, and occurred during the latter half of

the month. At the Gulf stations the greatest daily ranges varied from 14° to 27°.

The least daily ranges over the entire country varied from 4° at stations on the Atlantic, Pacific, and Gulf coasts to 28° in Arizona. In the Lake region, Atlantic coast, and Gulf States, and along the immediate coast of the Pacific, the least daily ranges were generally less than 5°; over the central valleys they varied from 5° to 10°, and west of the one hundredth meridian, except on the Pacific coast, they exceeded 10°.

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures of June for a series of years, the mean temperature for June, 1887, and the departures from the normal:

Station.	County.	Normal temperature for June.	Number of years.	Mean temperature for June, 1887.	Departure.
<i>Arkansas.</i>		0		0	0
Lead Hill.....	Boone.....	76.9	5	76.3	- 0.6
<i>California.</i>					
Sacramento.....	Sacramento.....	70.4	21	68.8	- 1.6
<i>Connecticut.</i>					
Middletown *.....	Middlesex.....	66.0	29	65.6	- 0.4
New Haven *.....	New Haven.....	67.0	101	65.5	- 1.5
Thompson *.....	Windham.....	65.0	30	64.0	- 1.0
Waterbury *.....	New Haven.....	67.4	12	65.5	- 1.9
<i>Illinois.</i>					
Mattoon.....	Coles.....	71.0	7	73.0	+ 2.0
Peoria.....	Peoria.....	73.5	32	77.7	+ 4.2
Riley.....	McHenry.....	66.2	25	69.0	+ 2.8
Sycamore.....	De Kalb.....	67.1	7	69.5	+ 2.4
<i>Indiana.</i>					
Blue Lick.....	Clark.....	71.7	10	73.7	+ 2.0
Connersville.....	Fayette.....	70.5	5	73.9	+ 3.4
Lafayette.....	Tippicanoe.....	70.1	8	74.3	+ 4.2
Logansport.....	Cass.....	73.9	33	75.1	+ 1.2
Sumner.....	Ripley.....	73.2	4	74.4	+ 1.2
Vevay.....	Switzerland.....	74.1	21	73.4	- 0.7
Worthington.....	Greene.....	70.4	5	74.4	+ 4.0
<i>Iowa.</i>					
Cresco.....	Howard.....	65.1	10	70.8	+ 5.7
Clinton.....	Clinton.....	68.7	9	72.6	+ 3.9
Monticello.....	Jones.....	68.4	34	72.0	+ 3.6
<i>Kansas.</i>					
Independence.....	Montgomery.....	72.8	16	76.5	+ 3.7
Wellington.....	Sumner.....	73.9	9	76.3	+ 2.4
<i>Maine.</i>					
Belfast *.....	Waldo.....	61.2	28	60.2	- 1.0
Cornish.....	York.....	66.3	30	64.6	- 1.7
Gardiner *.....	Kennebec.....	63.3	51	62.0	- 1.3
Orono *.....	Penobscot.....	62.4	19	62.8	+ 0.4
<i>Maryland.</i>					
Cumberland.....	Alleghany.....	69.5	16	69.6	+ 0.1
Fallston.....	Harford.....	70.2	16	68.6	- 1.6
<i>Massachusetts.</i>					
Amherst *.....	Hampshire.....	66.1	50	67.6	+ 1.5
Cambridge *.....	Middlesex.....	66.6	65	65.3	- 1.3
Fitchburg *.....	Worcester.....	65.6	31	65.3	- 0.3
New Bedford *.....	Bristol.....	60.0	75	62.7	+ 2.7
Somerset.....	Bristol.....	69.1	17	68.1	- 1.0
Springfield *.....	Hampden.....	68.5	20	68.1	- 0.4
Taunton *.....	Bristol.....	68.6	16	64.0	- 4.6
Williamstown *.....	Berkshire.....	66.0	34	65.2	- 0.8
<i>Nevada.</i>					
Carson City.....	Ormsby.....	64.9	8	65.4	+ 0.5
<i>New Hampshire.</i>					
Concord *.....	Merrimac.....	65.5	19	63.8	- 1.7
Hanover *.....	Grafton.....	65.3	28	64.6	- 0.7
<i>New Jersey.</i>					
Dover.....	Morris.....	67.6	5	67.2	- 0.4
South Orange.....	Essex.....	69.4	17	67.1	- 2.3
<i>New York.</i>					
North Volney.....	Oswego.....	64.9	19	65.4	+ 0.5
Palermo.....	Oswego.....	67.7	33	64.8	- 2.9
<i>Ohio.</i>					
Wauseon.....	Fulton.....	68.3	17	69.2	+ 0.9
<i>Pennsylvania.</i>					
Dyberry.....	Wayne.....	64.6	21	66.1	+ 1.5
<i>South Carolina.</i>					
Stateburg.....	Sumter.....	76.3	7	76.2	- 0.1
<i>Texas.</i>					
New Ulm.....	Austin.....	80.5	15	79.2	- 1.3
<i>Vermont.</i>					
Newport *.....	Orleans.....	65.3	13	66.0	+ 0.7
Strafford.....	Orange.....	65.0	13	66.2	+ 1.2
<i>Virginia.</i>					
Bird's Nest.....	Northampton.....	74.4	18	70.4	- 4.0
Dale Enterprise.....	Rockingham.....	70.7	7	75.9	+ 5.2
Variety Mills.....	Nelson.....	70.9	10	69.8	- 1.1
Wytheville.....	Wythe.....	68.2	24	68.2	0.0
<i>West Virginia.</i>					
Helvetia.....	Randolph.....	66.1	10	65.8	- 0.3

* From the "Bulletin of the New England Meteorological Society."

The following notes on temperature are furnished by voluntary observers:

Illinois.—Peoria, Peoria Co.: the mean temperature for June, 1887, 77°.

is the highest June mean, with one exception, viz., 79°, in 1873, that has occurred during the last thirty-two years.

Indiana.—Logansport, Cass Co.: during the last thirty-three years the highest maximum temperature for June, 106°, occurred in 1872; the lowest minimum temperature, 43°, in 1885.

Vevay, Switzerland Co.: the highest June maximum temperature during the last twenty-one years, 99°, occurred in 1866 and 1867, respectively; the lowest June minimum temperature for the same period, 46°, in 1878.

Iowa.—Monticello, Jones Co.: during thirty-four years past the highest June maximum temperature, 102°, occurred in 1856 and 1870, and the lowest June minimum temperature, 36°, in 1855 and 1886, respectively.

Kansas.—Wellington, Sumner Co.: the maximum temperature for June, 1887, 99°, is the highest, with one exception, viz., in 1882 (when a similar maximum was recorded), that is shown by the record of nine years' observations; the lowest June minimum temperature in that time, 37°, occurred in 1879.

Maryland.—Cumberland, Alleghany Co.: during the past sixteen years the extreme June temperatures were 93°, in 1874, and 45°, in 1887.

Ohio.—Wauseon, Fulton Co.: in the past seventeen years the highest maximum temperature for June is 99°, in 1874, and the lowest minimum temperature, 34°, in 1883.

South Carolina.—Stateburg, Sumter Co.: the maximum temperature of this month, 99°, is the highest June maximum temperature, with one exception, viz., June, 1881 (which had a similar maximum), that has occurred during the last seventeen years; the lowest minimum temperature for June in that time, 52°, occurred also during the present month.

Texas.—New Ulm, Austin Co.: during the past fifteen years the highest June maximum temperature, 102°, occurred in 1881; the lowest June minimum temperature, 55°, in 1877.

In the following table are given the highest and lowest monthly mean temperatures from July, 1872, to June, 1887, with the monthly normals at New Ulm:

Month.	Highest mean temperature.	Year.	Lowest mean temperature.	Year.	Normal temperature for fifteen years.
	0		0		0
July.....	85.0	1879	80.6	1880	82.7
August.....	84.4	1873	79.4	1879, 1882	81.5
September.....	81.0	1872	75.0	1876	77.0
October.....	73.9	1881	65.8	1873	69.9
November.....	65.6	1879	49.6	1880	59.1
December.....	60.9	1875	46.1	1876	53.9
January.....	63.7	1880	43.2	1881	50.3
February.....	61.9	1882	53.3	1881	56.0
March.....	68.4	1879	58.0	1885	63.0
April.....	71.5	1878	63.6	1874	68.3
May.....	77.4	1879	72.0	1885	74.0
June.....	85.0	1881	79.0	1884	80.5

* Normal for fourteen years only; no monthly means given for December, 1884, and January and February, 1885.

Virginia.—Wytheville, Wythe Co.: the minimum temperature for the present month, 41°, is the lowest June minimum temperature shown by the record of twenty-four years' observations.

FROSTS.

Frosts occurred in the various states and territories during the month as follows:

California.—Fort Bidwell, 6th, 26th.

Dakota.—Fort Totten, 4th, 23d.

Idaho.—Fort Sherman, 26th.

Illinois.—Sycamore, 23d to 25th; Riley, 24th.

Iowa.—Des Moines, 1st, 2d; Independence and Monticello, 24th.

Kentucky.—Midway, 23d.

Maine.—Eastport, 5th.

Massachusetts.—Westborough, 11th.

Minnesota.—Saint Vincent, 4th, 11th, 23d, 24th; during the night of the 3d-4th the temperature fell to 34° and a killing frost occurred; while the wheat crop was but slightly injured considerable damage was done to garden products.

Nebraska.—Genoa, 23d.

Nevada.—Carson City, 3d, 5th to 7th, 10th, 13th.

New Hampshire.—Mount Washington, 11th.

New Jersey.—Salem, 11th.

North Carolina.—Lenoir, 12th, 13th.

Oregon.—Fort Klamath, 1st, 4th, 5th, 8th, 14th, 17th, 26th, 27th; Linkville, 3d to 6th, 26th.

Vermont.—Strafford, 11th.

Virginia.—Dale Enterprise, 12th; Wytheville, 12th, 13th.

Washington Territory.—Olympia, 1st, 2d. The Signal Service observer at Walla Walla states that it was reported that

frost occurred eight miles southeast of that station on the morning of the 27th, causing injury to garden vegetables.

West Virginia.—Mr. S. F. H. Hewit, voluntary observer at Middlebrook, Randolph Co., reports as follows:

Between this place and Valley Head, from two to three miles distant and about six hundred feet lower, there was on June 12th and 13th heavy white frost. Corn was, in places, bitten close to the ground and beans were frozen stiff. I have not yet learned whether any material damage was done or not. On the sea-coast such a frost would have killed the corn and beans. Here it seems that these late frosts simply check, for a time, the growth of corn, when it then takes a new start and finally produces a crop.

Wisconsin.—Fond du Lac, 24th.

Wyoming.—Fort Bridger, 3d, 5th.

ICE.

Ice is reported to have formed during the month at Fort Bidwell, Cal., 5th, and at Carson City, Nev., 6th, 13th.

Table of comparative maximum and minimum temperatures for June.

State or Territory.	Station.	For 1887.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
Alabama	Mobile	93.3	62.6	100.0	1882	61.0	1879
Do	Montgomery	102.0	61.6	105.3	1881	58.0	1879, 1877
Arizona	Prescott	97.0	35.6	102.0	1878	32.0	1880
Do	Fort Apache	102.0	39.3	101.0	1883	33.3	1885
Arkansas	Fort Smith	94.8	37.1	101.0	1882	30.0	1882
Do	Little Rock	96.0	39.0	98.0	1882	35.0	1882
California	San Francisco	90.0	48.5	95.3	1883	48.0	1871, 1874
Do	San Diego	78.0	54.0	94.0	1877	50.0	1884
Colorado	Denver	95.9	43.7	99.0	1873	37.0	1883
Do	Pike's Peak	55.8	20.6	63.0	1881	3.0	1882
Connecticut	New Haven	90.2	44.2	92.0	1880	41.4	1884
Do	New London	84.5	47.4	89.0	1880	43.0	1876, 1884
Dakota	Fort Buford	98.4	39.4	107.0	1883	30.0	1883
Do	Yankton	93.9	44.7	97.0	1870	38.0	1879
District of Columbia	Washington City	94.7	50.1	102.5	1874	46.5	1873
Florida	Jacksonville	95.1	64.1	100.5	1880	61.7	1884
Do	Key West	87.1	68.6	99.8	1886	71.2	1882
Georgia	Atlanta	97.0	57.1	94.8	1881	54.0	1879
Do	Savannah	99.7	60.0	100.0	1880	58.5	1884
Idaho	Boise City	94.7	37.6	98.6	1885	36.0	1882
Illinois	Chicago	95.7	54.3	96.0	1873	50.0	1877
Do	Chicago	96.4	47.9	98.0	1872	40.0	1875
Indiana	Indianapolis	94.0	49.4	96.0	1874	41.1	1885
Indian Territory	Fort Hill	97.0	60.3	105.0	1881	47.0	1879
Iowa	Des Moines	95.6	45.3	98.0	1874	40.0	1877
Do	Des Moines	91.8	45.0	101.4	1886	43.9	1885
Kansas	Dodge City	101.7	35.0	103.0	1880	40.0	1879
Do	Leavenworth	95.8	51.0	99.0	1875	45.0	1882, 1877
Kentucky	Louisville	96.5	52.6	100.0	1874	49.0	1875
Louisiana	New Orleans	91.2	66.3	97.0	1881	63.0	1879
Do	Shreveport	100.7	66.3	104.0	1875	53.0	1877
Maine	Eastport	74.2	41.6	82.0	1884	30.0	1875
Do	Portland	88.6	43.3	94.0	1876	42.0	1875
Maryland	Baltimore	93.7	51.8	97.5	1874	49.0	1873
Massachusetts	Boston	89.0	47.5	98.0	1874	42.0	1884
Michigan	Marquette	90.7	40.5	95.0	1879	31.0	1881
Do	Grand Haven	84.0	48.1	88.0	1874	39.3	1885
Minnesota	Saint Vincent	92.9	34.2	93.0	1883	29.0	1883
Do	Saint Paul	89.6	48.3	94.0	1874	36.0	1885

Table of comparative maximum and minimum temperatures—Continued.

State or Territory.	Station.	For 1887.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
Mississippi	Vicksburg	97.3	64.3	101.0	1881	53.0	1879
Missouri	Saint Louis	97.0	57.2	99.0	1881	48.0	1877
Montana	Fort Assinaboine	87.3	36.6	101.0	1883	31.0	1883
Do	Helena	85.4	33.3	95.0	1880	31.0	1880
Nebraska	North Platte	94.0	49.0	101.0	1876	33.0	1876
Do	Omaha	94.0	49.1	98.0	1881	42.0	1877
Nevada	Winnemucca	97.7	29.6	95.0	1881	29.0	1880
New Hampshire	Mount Washington	67.2	33.0	71.0	1878	15.0	1878, 1879
New Jersey	Atlantic City	95.1	53.7	93.0	74, '80, '81	45.0	1878
New Mexico	Santa Fe	85.5	48.0	92.0	1881	33.0	1880
New York	Buffalo	86.3	51.9	92.0	1876	40.5	1879
Do	New York City	90.1	51.3	95.0	1875	47.0	1878, 1879
North Carolina	Charlotte	101.9	52.8	97.0	1881	51.5	1884
Do	Wilmington	97.9	33.0	100.0	1880	51.0	1884
Ohio	Cincinnati	90.9	52.4	98.5	1874	48.1	1885
Do	Sandusky	91.0	48.9	96.0	1885	45.9	1885
Oregon	Portland	95.3	43.5	99.0	1876	39.0	1875
Do	Roseburg	97.1	52.2	96.5	1878	37.5	1880
Pennsylvania	Pittsburg	93.9	52.2	98.0	1874	39.0	1879
Do	Philadelphia	93.1	53.2	97.0	1874	47.2	1884
Rhode Island	Block Island	80.0	49.2	82.6	1884	46.3	1884
South Carolina	Charleston	99.6	47.4	100.0	1877	58.2	1874
Tennessee	Knoxville	96.0	51.4	96.0	1880	47.0	1878
Do	Memphis	96.6	55.6	100.0	1881	54.0	1879
Texas	Brownsville	91.2	68.5	102.0	1878	63.0	1877
Do	Fort Elliott	94.3	57.3	100.0	1880, 1881	44.0	1880, 1882
Utah	Salt Lake City	97.7	49.3	97.0	1874	49.0	1880
Virginia	Lynchburg	95.5	52.5	102.0	1874	53.0	1876, 1884
Do	Norfolk	92.6	58.2	95.4	1883	39.0	1882
Washington Ter.	Spokane Falls	93.2	36.2	95.0	1876	36.0	1880
Do	Olympia	93.1	44.2	98.0	1874	40.0	1876
Wisconsin	La Crosse	92.4	40.7	94.0	1872, 1874	39.8	1885
Do	Milwaukee	92.4	40.7	94.0	1880, 1881	28.0	1876
Wyoming	Cheyenne	90.4	34.0	97.0	1880, 1881	28.0	1876

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature, as observed at the harbors of the several stations; the monthly range of water temperature; the average depth at which the observations were made, and the mean temperature of the air:

Temperature of water for June, 1887.

Station.	Temperature at bottom.				Mean temperature of the air at station.	Average depth of water, feet and tenths.
	Max.	Min.	Range.	Monthly mean.		
Cedar Keys, Fla.	83.8	77.9	5.9	81.5	78.7	8.3
Eastport, Me.	48.0	42.0	6.0	44.2	54.3	16.2
Galveston, Tex.	87.3	80.0	7.3	82.9	79.9	15.0
Key West, Fla.	87.9	79.9	8.0	83.4	79.3	21.1
New London, Conn.	65.0	54.3	10.7	59.4	64.3	12.1
New York City	71.6	63.1	8.5	67.7	68.2	15.7
Portland, Me.	61.0	49.8	11.2	53.3	61.5	17.5
Des Moines, Iowa	10.53				4.82	
Memphis, Tenn.	8.42				4.21	
Dubuque, Iowa	7.35				3.99	
Grand Haven, Mich.	6.80				3.92	
Keokuk, Iowa	6.43				3.88	
La Crosse, Wis.	5.10				3.56	
Milwaukee, Wis.	4.26				3.31	
Springfield, Ill.	3.99				3.06	

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for June, 1887, as determined from the reports of about eight hundred stations, is exhibited on chart iii. In the table of miscellaneous meteorological data are given, for each Signal Service station, the total precipitation, with the departures from the normal. The figures opposite the names of the geographical districts in columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal, and subtracting when above.

The rainfall of June was very heavy along the Gulf coast, in the lower Rio Grande valley, Florida Peninsula, and in southeastern Georgia; it was also very heavy in the extreme northern portions of Dakota and Montana, and adjacent portion of the British Northwest Territory. In the east Gulf states the excess amounted to two inches, and in the Rio Grande Valley it was nearly nine inches; in the latter district the rainfall was about four times as great as the average for June. In

New England and the middle Atlantic states slightly more than the average amount of rain fell during the month.

In the Lake region and central valleys the rainfall was below the average, the deficiencies being very marked in the upper lake region and the Ohio and upper Mississippi valleys, where there was less than one-half of the average amount of rain.

The following are some of the most marked departures from the normal precipitation at Signal Service stations:

Above normal.		Below normal.	
Inches.		Inches.	
Brownsville, Tex.	10.53	Des Moines, Iowa	4.82
Pensacola, Fla.	8.42	Memphis, Tenn.	4.21
Fort Assinaboine, Mont.	7.35	Dubuque, Iowa	3.99
Rio Grande City, Tex.	6.80	Grand Haven, Mich.	3.92
Southport, N. C.	6.43	Keokuk, Iowa	3.88
New Orleans, La.	5.10	La Crosse, Wis.	3.56
Key West, Fla.	4.26	Milwaukee, Wis.	3.31
Jacksonville, Fla.	3.99	Springfield, Ill.	3.06

In the table below is given the total precipitation for the

several geographical districts for the first half of the year—January to June, 1887; also the average for several years, with the excess or deficiency of the current year as shown by comparison with the average of several years:

Precipitation for the six months, January to June.

Districts.	Average for several years.	Total for 1887.	Departure.
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
New England.....	23.88	24.18	+0.30
Middle Atlantic states.....	20.99	19.39	-1.60
South Atlantic states.....	26.33	21.48	-4.85
Florida Peninsula.....	21.27	19.17	-2.10
East Gulf states.....	32.96	23.85	-9.11
West Gulf states.....	24.79	17.34	-7.45
Rio Grande Valley.....	9.93	18.34	+8.41
Tennessee.....	31.88	27.85	-4.03
Ohio Valley.....	24.69	24.68	-0.01
Lower lake region.....	17.43	17.22	-0.21
Upper lake region.....	16.12	12.41	-3.71
Extreme northwest.....	9.57	8.46	-1.11
Upper Mississippi valley.....	18.91	12.84	-6.07
Missouri Valley.....	14.41	10.57	-3.84
Northern slope.....	8.69	9.97	+1.28
Middle slope.....	11.64	10.49	-1.15
Southern slope.....	8.98	7.15	-1.83
Southern plateau.....	4.42	2.80	-1.62
Middle plateau.....	7.69	5.57	-2.12
Northern plateau.....	10.95	10.52	-0.43
North Pacific coast region.....	25.50	35.02	+9.52
Middle Pacific coast region.....	15.27	11.64	-3.63
South Pacific coast region.....	8.06	7.47	-0.59

From the above table it will be seen that over nearly the entire country the rainfall for the first half of the year is deficient, and that the deficiency is most marked in the south Atlantic and Gulf states, Tennessee, upper lake region, upper Mississippi and lower Missouri valleys, and on the middle Pacific coast. In New England, the lower lake region, middle Atlantic states, and Ohio Valley nearly the normal amount of rain has fallen, while in the lower Rio Grande valley and on the north Pacific coast a large excess is shown.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month of June for a series of years, the precipitation for June, 1887, and the departures from the average:

Station.	County.	Average precipitation for June.	Number of years.	Precipitation for June, 1887.	Departure.
		<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
<i>Arkansas.</i>					
Lead Hill.....	Boone.....	5.21	5	6.07	+0.86
<i>California.</i>					
Sacramento.....	Sacramento.....	0.20	21	trace.	-0.20
<i>Connecticut.</i>					
Canton *.....	Hartford.....	4.82	26	6.29	+1.47
Hartford *.....	Hartford.....	3.10	16	5.55	+2.45
Middletown *.....	Middlesex.....	3.74	29	6.13	+2.39
Wallingford *.....	New Haven.....	3.84	30	8.12	+4.28
<i>Illinois.</i>					
Mattoon.....	Coles.....	5.09	7	1.03	-4.06
Peoria.....	Peoria.....	3.93	32	1.53	-2.40
Riley.....	McHenry.....	4.09	26	1.33	-2.76
Sandwich.....	De Kalb.....	4.16	35	1.77	-2.39
Sycamore.....	De Kalb.....	3.74	7	1.12	-2.62
<i>Indiana.</i>					
Blue Lick.....	Clark.....	4.12	5	2.15	-1.97
Connersville.....	Fayette.....	4.80	5	4.25	-0.55
Lafayette.....	Tippecanoe.....	5.20	8	1.97	-3.23
Logansport.....	Cass.....	3.90	33	2.95	-0.95
Summan.....	Ripley.....	4.40	4	3.55	-0.85
Vevay.....	Switzerland.....	5.07	21	1.98	-3.09
Worthington.....	Greene.....	4.20	5	0.53	-3.67
<i>Iowa.</i>					
Cresco.....	Howard.....	5.03	14	2.46	-2.57
Monticello.....	Jones.....	4.28	34	1.49	-2.79
<i>Kansas.</i>					
Independence.....	Montgomery.....	5.75	15	4.25	-1.50
Wellington.....	Sumner.....	4.45	9	2.43	-2.02
<i>Maine.</i>					
Cornish.....	York.....	3.34	30	4.32	+0.98
Gardiner *.....	Kennebec.....	3.27	49	3.42	+0.15
Orono *.....	Penobscot.....	3.28	19	3.36	+0.08
<i>Maryland.</i>					
Cumberland.....	Alleghany.....	3.43	16	3.87	+0.44
Fallston.....	Harford.....	4.25	16	5.14	+0.89
New Midway.....	Frederick.....	4.44	6	3.84	-0.60
<i>Massachusetts.</i>					
Amherst.....	Hampshire.....	3.72	52	5.46	+1.74
Cambridge *.....	Middlesex.....	3.07	46	1.90	-1.17
Chestnut Hill *.....	Middlesex.....	2.86	12	2.08	-0.78
Framingham *.....	Middlesex.....	2.87	15	2.42	-0.45

Deviations from average precipitation—Continued.

Station.	County.	Average precipitation for June.	Number of years.	Precipitation for June, 1887.	Departure.
		<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
<i>Massachusetts—Continued.</i>					
Lake Cochituate *.....	Middlesex.....	3.38	36	2.58	-0.80
Ludlow *.....	Hampden.....	3.76	12	5.38	+1.62
Lynn *.....	Essex.....	3.03	13	2.24	-0.79
Mystic Lake *.....	Middlesex.....	2.88	12	2.69	-0.19
New Bedford *.....	Bristol.....	3.17	74	3.15	-0.02
Somerset.....	Bristol.....	3.31	17	4.03	+0.72
Springfield *.....	Hampden.....	3.87	40	6.44	+2.57
Waltham *.....	Middlesex.....	3.17	63	2.97	-0.20
Williamstown *.....	Berkshire.....	3.44	19	4.33	+0.89
<i>Nevada.</i>					
Carson City.....	Ormsby.....	0.84	8	0.46	-0.38
<i>New Hampshire.</i>					
Concord *.....	Merrimack.....	3.30	32	4.56	+1.26
Hannover *.....	Grafton.....	3.17	23	2.74	-0.43
<i>New Jersey.</i>					
Dover.....	Morris.....	2.59	5	7.06	+4.47
South Orange.....	Essex.....	3.36	17	5.50	+2.14
<i>New York.</i>					
Humphrey.....	Cattaraugus.....	5.16	3	2.14	-3.02
Palermo.....	Oswego.....	3.07	33	2.27	-0.80
<i>Ohio.</i>					
Wauseon.....	Fulton.....	4.29	15	3.55	-0.74
<i>Pennsylvania.</i>					
Dyberry.....	Wayne.....	3.21	15	3.91	+0.70
<i>South Carolina.</i>					
Stateburg.....	Sumter.....	3.40	7	2.10	-1.30
<i>Texas.</i>					
New Ulm.....	Austin.....	3.49	15	2.24	-1.25
<i>Vermont.</i>					
Newport.....	Orleans.....	4.00	13	3.77	-0.23
Strafford.....	Orange.....	3.40	13	4.70	+1.30
<i>Virginia.</i>					
Bird's Nest.....	Northampton.....	3.22	18	1.65	-1.57
Dale Enterprise.....	Rockingham.....	6.08	7	5.35	-0.73
Variety Mills.....	Nelson.....	3.74	8	3.27	-0.47
Wytheville.....	Wythe.....	3.96	24	3.67	-0.29
<i>West Virginia.</i>					
Helvetia.....	Randolph.....	10.43	10	8.14	-2.29

* From the "Bulletin of the New England Meteorological Society."

The following notes on precipitation are furnished by the voluntary observers:

Illinois.—Sandwich, De Kalb Co.: the total precipitation for the six months ending June 30th is 5.32 below the normal for the last thirty-five years.

Indiana.—Logansport, Cass Co.: during the last thirty-three years the greatest precipitation for June, 8.99, occurred in 1882, the least, 0.55, in 1863.

Vevay, Switzerland Co.: the total precipitation for the present month, 1.98, is, with one exception, viz., 1.36, in 1873, the least June precipitation that has occurred during the last twenty-one years; the greatest June precipitation in that time, 8.41, was recorded in 1875.

Iowa.—Monticello, Jones Co.: during the last thirty-four years the greatest precipitation for June, 9.02, occurred in 1865; the least, 0.74, in 1857.

Kansas.—Wellington, Sumner Co.: the total precipitation for the six months ending June 30th, is about one-half less than the average for the same months of the last nine years.

Maryland.—Cumberland, Alleghany Co.: the greatest precipitation during the last sixteen years, 5.84, occurred in 1880; the least, 0.86, in 1885.

Fallston, Harford Co.: in the last sixteen years the greatest precipitation for June, 10.21, occurred in 1883; the least, 1.05, in 1873.

New Midway, Frederick Co.: the precipitation of June, 1884, 7.75, is greater than that of any June during the last six years; that of 1886, 2.50, is the least.

New York.—Palermo, Oswego Co.: during the past thirty-three years the largest June precipitation occurred in 1865, 8.80; the least in 1864 and 1870, 0.70.

Ohio.—Wauseon, Fulton Co.: in the past fifteen years the greatest June precipitation, 8.43, occurred in 1881; the least, 1.43, in 1872; the total precipitation for the first six months of 1887, 19.61 (one third of this amount fell during February), is 0.84 above the average of fifteen years; the largest precipitation for the same months in that time, 29.92, occurred in 1876; the least, 9.57, in 1872.

Pennsylvania.—Dyberry, Wayne Co.: the largest precipitation for June in the past fifteen years, 5.38, occurred in 1883; the least, 1.13, in 1873.

South Carolina.—Stateburg, Sumter Co.: during the last seven years the greatest June precipitation, 5.35, occurred in 1886; the least, 1.38, in 1881.

Vermont.—Strafford, Orange Co.: during the past thirteen years the greatest precipitation, 6.30, occurred in 1876; the least, 1.60, in 1885.

Virginia.—Dale Enterprise, Rockingham Co.: the greatest June precipitation during the last seven years, 11.00, occurred in 1884; the least, 1.13, in 1883.

Variety Mills, Nelson Co.: during the past eight years the greatest June precipitation occurred in 1886, 6.21; the least in 1880, 1.46.

Wytheville, Wythe Co.: the total precipitation for the six months ending June 30th, 19.91, is 1.87 less than the average for a period of twenty-four years.

Texas.—The following table shows the greatest monthly precipitation from

July, 1872, to June, 1887, with the monthly averages, at New Ulm, Austin Co.

Month.	Precipitation.				
	Greatest.	Year.	Least.	Year.	Average for fifteen years.
	Inches.		Inches.		Inches.
July.....	14.33	1873	0.00	1884	4.33
August.....	8.38	1874	0.09	1885	3.12
September.....	15.06	1874	0.90	1874	5.84
October.....	12.44	1881	0.79	1874	4.13
November.....	14.90	1873	0.75	1879	3.41
December.....	10.43	1875	0.44	1880	*4.59
January.....	10.56	1880	1.09	1887	*4.13
February.....	10.94	1882	1.06	1885	4.53
March.....	11.13	1883	1.27	1887	5.07
April.....	8.03	1873	0.17	1887	3.84
May.....	12.38	1882	0.05	1886	5.70
June.....	11.33	1873	0.51	1885	3.49

* Average for fourteen years only; no data given for December, 1884, and January, 1885.

SNOW.

Fort Maginnis, Mont.: on 2d light rain fell from 1.10 to 1.20 p. m.; at the latter hour the rain changed to snow, which continued until 5.15 p. m., melting as it fell.

Fort Assinaboine, Mont.: a heavy snowfall in the Bear Paw Mountains and Sweet Grass Hills was visible from this station on the 4th.

Lakeview, Oregon: light rain and snow began at 1 a. m. and continued until 11.45 a. m. on the 5th, the snow melting as it fell.

Linkville, Oregon: two inches of snow on the ground at Tule (or Modoc) Lake, twenty miles southeast of Linkville, was reported on the 6th.

Carson City, Nev.: snow fell on the mountains west of this place on the 12th, 13th, and 14th.

Mr. Hiram Arents, voluntary observer at Oroville, Butte Co., Cal., reports under date the 12th, as follows:

At 6 p. m. a heavy hail and rain storm, with thunder and lightning, passed north of Oroville, the course of the storm being from southwest to northeast. On the summit of the Sierra Nevada Mountains, on the Oroville and Susanville road, twelve inches of snow fell.

The following appeared in the "Daily News" (published at Lynchburg, Va.) of June 12th:

Those who were asleep yesterday morning at four o'clock were surprised to learn later in the day that snow fell about that hour, and early risers saw a thin white covering on the Blue Ridge Mountains, which soon disappeared after the sun came out. Old citizens were, however, equal to the emergency, and remembered that snow fell here in 1857, on the 11th of June. The change in temperature was quite sudden, and a cool breeze prevailed during the day.

Snow was also reported to have fallen at—

Pike's Peak, Col., on the 1st, 2d, 9th, 18th, and 24th; the snowfall for these dates aggregating 1.9 inches.

Camp Sheridan, Wyo., 2d, to a depth of 1.5 inches.

Fort Bidwell, Cal., 4th.

At Summit, Cal., snow fell to a depth of 3 inches during the month; date not given.

HAIL.

Under the heading "Local storms" will be found descriptions of the more severe hail storms which have occurred during the month. In addition to these, hail was reported to have fallen in the various states and territories as follows:

Alabama.—Greensborough, 1st.

Arizona.—Fort Bowie, 2d; Fort Apache, 27th; Prescott, 28th.

Arkansas.—Hot Springs, 2d.

California.—Nicolaus and Oroville, 12th.

Colorado.—Las Animas, 4th; Pike's Peak, 20th, 26th to 30th.

Dakota.—Fort Meade, 2d, 29th; Deadwood, 2d, 30th; Fort Buford, 5th; Fort Yates, 16th; Henry and Huron, 18th; Fort Sully, 19th.

Illinois.—Springfield, 1st.

Indian Territory.—Fort Gibson, 2d.

Iowa.—Clinton, 1st; Independence and Bancroft, 18th; Des Moines, 19th.

Table of excessive and greatest monthly precipitation for June, 1887.

Station.	Specially heavy.		Largest monthly.	Station.	Specially heavy.		Largest monthly.
	Date.	Amt.			Date.	Amt.	
Alabama.				Missouri—Con.			
Mobile.....	20, 21	3.20	8.91	Pleasant Hill.....			6.55
Mount Vernon.....			6.17	Montana.			
Evergreen.....	27 to 29	3.15		Fort Assinaboine	15, 16	4.28	9.33
Connecticut.				Nebraska.			
Wallingford.....			8.12	Marquette.....	10, 11	3.75	7.22
Canton.....			6.29	Weeping Water.....			7.12
Middletown.....			6.13	De Soto.....	6, 7	2.85	
Voluntown.....	23, 24	2.30		Valentine.....	27, 28	2.12	
Hartford.....	23, 24	3.53		New Hampshire.			
New London.....	23, 24	2.23		Mt. Washington.....	21 to 24	5.84	9.78
New Haven.....	23, 24	2.74		Bristol.....	22 to 24	4.05	6.78
Dakota.				Woodstock.....	21 to 23	4.52	6.73
Fort Totten.....	15, 16	2.55		Antrim.....	30 to 24	4.31	6.32
Dist. of Columbia.				Ashland.....	21 to 23	3.76	6.09
Receiv. Reservoir	23	2.53		Berlin Mills.....	21 to 23	3.40	
Florida.				Lake Village.....	22, 23	3.79	
Pensacola.....	28, 29	11.14	14.11	Wier's Bridge.....	21 to 23	3.87	
Manatee.....	11	2.59	10.88	Belmont.....	23, 24	3.62	
Limona.....	12, 13	2.03	10.29	Wolfsborough.....	23, 24	2.28	
Do.....	27, 28	4.05		New Jersey.			
Jacksonville.....	26, 27	3.24	9.68	Lambertville.....			10.29
Cedar Keys.....	27, 28	2.55	8.66	Tenafly.....			9.57
Key West.....	15, 16	3.70	8.22	Imlaystown.....			8.19
Fort Meade.....	11, 12	5.00	8.08	Red Bank.....			8.06
Merritt's Island.....			6.47	Hopewell.....			7.82
Sanford.....	10, 11	3.01	6.12	Locktown.....			7.78
Duke.....	26, 27	2.20		Oceanic.....			7.67
Georgia.				Roseland.....	22, 23	4.05	7.60
Savannah.....	26 to 28	7.68	10.76	Paterson.....			7.47
Jessup.....	26 to 28	5.86	7.64	Dover.....	22, 23	3.74	7.06
Athens.....	21	2.40		Newark.....			7.00
Griffin.....	2	2.19		Union.....			6.87
Augusta.....	23 to 24	2.65		Harrisville.....			6.79
Union Point.....	2	2.20		West Point.....	22, 23	4.00	6.30
Eastman.....	26 to 28	3.06		New Brunswick.....			6.28
Illinois.				Moorestown.....	23, 24	3.66	6.19
Springfield.....	5	2.13		Rancocas.....			6.06
Indian Territory.				Beverly.....	22, 23	3.30	
Fort Sill.....	11, 12	2.08		South Orange.....	22, 23	2.85	
Iowa.				New York.			
Bancroft.....	11 to 14	4.02		White Plains.....	22, 23	2.63	7.99
Kansas.				New York City.....	22, 23	3.66	7.70
W. Leavenworth.....	1, 2	3.30	11.35	Boyd's Corners.....			7.70
Do.....	7	2.30		Fort Columbus.....	22 to 24	4.24	7.62
Do.....	9, 10	2.05		Brooklyn.....	22 to 24	4.64	7.49
Do.....	24	2.10		Do.....	22, 23	2.70	
Hilton.....	7 to 14	7.26	9.63	Setauket.....	1, 2	3.07	6.57
Topoka.....	24, 25	2.09	9.57	Menands.....	22, 23	2.00	
Banker Hill.....	10 to 12	5.50	7.60	North Carolina.			
Buffalo Park.....	30	2.00		Southport.....			9.74
Sheridan.....	8	2.00		Wilmington.....			6.41
Belleville.....	11, 12	3.15		Raleigh.....	22, 23	3.02	6.22
Carneiro.....	10, 11	2.40		Lenoir.....	21, 22	3.80	
Dorrance.....	10	3.75		Weldon.....	22, 23	2.07	
Ellis.....	8	2.00		Goldborough.....	22, 23	2.20	
Do.....	13	2.00		Charlotte.....	1, 2	2.42	
Dodge City.....	16, 17	3.20		Ohio.			
Louisiana.				West Milton.....			6.75
New Orleans.....	29	5.00	11.33	Pennsylvania.			
Lafayette.....	27 to 29	6.36	9.44	Germantown.....	23	3.60	7.40
Amite City.....			8.89	Philadelphia.....	22, 23	3.12	6.81
Coushatta.....	4	2.60		West Chester.....	22, 23	3.42	6.72
Opelousas.....	21, 22	2.13		Easton.....	22, 23	2.60	6.10
Natchitoches.....	4	3.15		Wilkesbarre.....			6.06
Alexandria.....	4	2.66		Quakertown.....	22, 23	2.54	
Maine.				Erie.....	0	3.64	
Eastport.....	22	3.18	6.01	South Carolina.			
Maryland.				Spartanburg.....	20	2.00	
Cumberland.....	6, 7	2.40		Aiken.....	1, 2	2.05	
Great Falls.....	22, 23	2.17		Anderson.....	2	3.60	
Massachusetts.				Hardeeville.....	23, 24	2.12	
Springfield.....			6.44	Do.....	27	2.03	
Fall River.....	1, 2	2.20		Tennessee.			
Taunton.....	1, 2	2.08		Manchester.....	21	2.60	
Deerfield.....	23, 24	3.70		Texas.			
Amherst.....	22 to 24	3.58		Brownsville.....	20, 21	8.45	13.80
Michigan.				Paris.....			8.76
Hudson.....	1, 2	2.64		Galveston.....	12, 13	4.44	8.28
Kalamazoo.....	8	3.53		Ringgold, Fort.....	20 to 23	4.36	8.17
Marquette.....	7, 8	2.19		Rio Grande City.....	20, 21	4.52	8.08
Mississippi.				Houston.....	25	3.07	7.81
Biloxi.....			8.22	Comfort.....	8	2.16	
Natchez.....	27, 28	5.01	6.79	Cuero.....	29	5.50	
Loch Leven.....			6.70	Tyler.....	4	2.00	
Macon.....	3	2.01		Longview.....	4	2.15	
Brookhaven.....	4	2.00		Vermont.			
Lake.....	28, 29	2.30		Stratford.....	23	2.00	
Oxford.....	27	2.70		Virginia.			
Missouri.				University of Va.			7.04
Houston.....			10.07	Dale Enterprise.....	20, 21	2.37	
Miami.....			7.88	West Virginia.			
Sedalia.....			7.83	Helvetia.....	8, 9	3.12	8.14
Springfield.....			6.65	Parkersburg.....	7, 8	2.14	

Kansas.—Allison and Wellington, 8th; Emporia, 12th; Concordia, 16th; Wakefield, 20th; Elk Falls and Independence, 24th; Wilson, 29th.

Louisiana.—Shreveport, 2d.

Maryland.—Baltimore, 18th.

Michigan.—Kalamazoo and Lansing, 17th; Port Huron, 22d.

Minnesota.—Moorhead, 19th.
Montana.—Poplar River, 9th, 10th, 14th; Fort Custer, 15th.
Nebraska.—Fort Robinson, 1st; Hay Springs, 1st, 19th;
 Tecumseh, 9th; Valentine, 26th.
New Hampshire.—Mount Washington, 10th, 24th, 26th.
New Jersey.—Salem, 21st.
New Mexico.—Santa Fé, 21st.
North Carolina.—Reidsville, 18th.
Ohio.—Columbus, 5th; Wauseon, 20th.
Oregon.—Fort Klamath, 5th; Linkville, 9th.
Pennsylvania.—State College, 2d.
Tennessee.—Knoxville, 1st; Ashwood, 1st, 3d; Nashville,
 10th.
Virginia.—University of Virginia, 1st; Dale Enterprise,
 20th.
Wyoming.—Cheyenne, 1st, 4th; Fort McKinney, 4th.

SLEET.

The observer at Pike's Peak, Colo., reports sleet to have fallen during the month on the following dates: 10th, 14th, 20th, 21st, 23d, 24th, 25th, 27th to 29th.

DROUGHT.

The severe drought which prevailed in previous months continued in some sections of the country, and, in some localities not previously affected by drought, the lack of rainfall during this month caused crops to suffer serious injury.

The following reports relate to the drought of June:

Arkansas.—Little Rock, 19th: the corn crop in this part of the state is suffering from the effects of drought.

Florida.—Pensacola, 3d: up to this date the season has been very dry; ponds in this vicinity that were never known to fail are now almost dry, and large numbers of fish have died. The drought in this section was ended by the heavy rains of the 12th and subsequent dates.

Georgia.—Milledgeville, Baldwin Co.: at the close of the month the weather was very dry; all crops, except cotton, have suffered serious injury.

Illinois.—Cambridge, Henry Co., 30th: owing to the protracted drought which prevailed in this state during the month drinking water in many towns has become polluted, and the dry beds of creeks have been covered with dead fish. Fires burned to a considerable extent in the woods, by which farmers have lost much cattle.

Sandwich, De Kalb Co.: during June the most protracted drought that has ever been known here prevailed in this and the adjacent counties.

Charleston, Coles Co., 30th: the month has been the driest ever known in this locality.

Rock Island, Rock Island Co., 30th: the farmers in this region report that owing to the severe drought it is feared that great injury will result to crops.

The "Monthly Weather Review" of the Illinois Weather Service for June, 1887, states:

A drought prevailed from the 9th until the end of the month, broken only by light local showers in the northern and central divisions of the state from the 18th to 20th, and in the southern division on the 24th and 25th.

Indiana.—Vevay, Switzerland Co., 30th: the continuous drought is becoming more severe every day; creeks and small streams are dry, and cisterns low.

Laconia, Harrison Co., 30th: the latter part of the month has been very dry, and vegetation suffered in consequence.

Iowa.—Mason City, Cerro Gordo Co., 7th: at this date the drought in this vicinity continues. The month of May, and thus far June, has been the driest known in northern Iowa since 1876. Streams are drying up, and herders find it difficult to obtain water for cattle.

The "Chicago Inter-Ocean" of June 19th contained the following:

MASON CITY, IOWA, June 18.—Rain fell in this section to-day to the depth of one and one-quarter inches. Corn has never been known to grow so rapidly as it has in the past week. Small grain is beginning to head out. The straw is short, but the crop will be much better than was at first anticipated. Oats

will be a three-quarter crop; clover and timothy are almost an entire failure; millet and Hungarian will be planted for late feeding for cattle.

Cedar Rapids, Iowa, June 18.—Reports from one hundred stations in northern Iowa, southern Dakota, and Minnesota show a general two hours' rain, worth thousands of dollars to crops. Small grain is safe from drought now, and corn promises a big crop. Hay is so light that farmers in many places are selling cattle on account of no feed.

Dubuque, 27th: the weather is clear and dry; crops are being ruined by the protracted drought; pastures have dried up, and stock is suffering.

Keokuk, 29th: the rain of this date broke the drought and was of great benefit to crops in this vicinity.

Fort Madison, Lee Co.: the weather during the month was very dry, and vegetation suffered much injury; on the 30th a much-needed rain fell, which greatly revived the crops.

Cedar Rapids, Linn Co.: the month of June has been very dry in this locality; although frequent passing showers have occurred there has not been a good soaking rain for several months; Cedar River at this point at the end of the month was the lowest known in eighteen years. Corn is looking well, but other crops are suffering from the dry weather.

Kansas.—Ninnescah, Kingman Co.: all crops, except corn, have suffered from drought during the month; a light rain fell on the 30th.

Kentucky.—Louisville: the drought which prevailed in this section during June has been the most protracted that has been known for many years. The total rainfall for the month, 1.79 inches, is the smallest recorded in June during the last fifteen years. But little rain fell after the 10th.

Michigan.—Thornville, Lapeer Co., 30th: the crops in this county were injured by drought during June; it is feared that the early-planted potatoes will prove a failure unless rain falls at an early date.

Grand Haven, 30th: the month has been unusually dry, and the complaint of farmers and gardeners throughout this section is general; small fruits, potatoes, and other crops have suffered great damage; the total precipitation for the month, 0.55 inch, is the least June rainfall that has been recorded since the establishment of the signal office in 1871; of the total rainfall (0.55 inch) for the month, 0.46 inch fell on the 1st.

Mississippi.—Oxford: the rainfall of the 27th broke a protracted drought in this vicinity; the crops were greatly benefited; previous to the above date no rain had fallen since the 11th.

Ohio.—West Milton, Miami Co.: drought prevailed in this section during the month; at the close of the month the pastures and crops were greatly in need of rain.

Yellow Springs, Greene, Co.: but very little rain fell in this locality after the 6th; corn has not been injured, but garden vegetables and fruits have suffered considerably.

South Carolina.—Providence, Sumter Co.: a dry, hot spell prevailed in this vicinity previous to the 20th; although it was of short duration considerable injury was done to gardens. A good rain fell on the 20th.

Kirkwood (near Camden), Kershaw Co., 30th: although abundant rains have fallen during the month within ten or fifteen miles of this place, the crops in this immediate vicinity have suffered serious injury from drought.

Tennessee.—Ashwood, Maury Co., 30th: unusually dry weather prevailed during the month; the total rainfall was only 1.26 inches.

Austin, Hawkins Co., 30th: a protracted drought prevails in this locality; crops (particularly corn, tobacco, and millet) are suffering from the effects of drought.

Wisconsin.—La Crosse, 6th: in portions of the surrounding country where the soil is sandy, complaints are general concerning the disastrous effects of drought; grasses of all kinds are suffering serious injury.

Lancaster, Grant Co.: the drought which prevailed in this vicinity since May was broken by the rains of the 18th and 20th. The drought caused serious injury to the various crops, especially hay.

Delavan, Walworth Co., 30th: the drought caused serious injury to pastures and crops of various kinds in this county.

Elkhorn, Walworth Co., 30th: the continued drought has caused great damage to crops in this county; in some parts of the county but little rains has fallen during the last seven weeks.

Burlington, Racine Co., 30th: the drought has practically destroyed all crops in this vicinity. The leaves have fallen from the willow trees in the lowlands, and tassels are coming out on the corn, although it is but two feet high.

La Crosse, 30th: the month of June, like May, is characterized by its high mean temperature (which is only exceeded by that of June, 1873) and the unusually small amount of rainfall, 0.98 inch, making it the driest June ever known. The severe drought prevailed from the beginning to the end of the month; it was not checked by the light showers of the 12th, 13th, 14th, 18th, and 20th. The condition of crops is diversified; while hay and winter wheat are being harvested fifteen days earlier than usual, with a very poor yield, the condition of corn is very good.

Chicago, Ill., 30th: the drought which prevails in the northern and central tiers of counties in this state is not more severe than it is in Wisconsin. In this latter state fruit and crops are nearly destroyed, and in some towns the authorities have taken steps to insure the economical use of water. Reports from northwestern Iowa state that the drought in that region has been broken by recent showers.

The "New York Herald" of July 2d contained the following:

The outcry that comes from the Northwest on account of the drought in the "wheat belt" is not groundless. The growing grain has suffered seriously from the June deficiency of rain, which must tell upon the yield of the harvest in a considerable area of the country.

Happily, however, the cry of distress from the Northwest was answered yesterday by local rains in the upper Mississippi valley and near the western lakes. The showers were not heavy enough in the drought-stricken districts to satisfy the parched and dusty fields, but they were helpful, and the meteorological conditions now give some promise of further rainfall in the regions of severest drought within the next two days.

WINDS.

The most frequent directions of the wind during June, 1887, are shown on chart ii by arrows flying with the wind; on the Atlantic coast north of Virginia they were southerly, and from Virginia southward they were mostly from the north; in the Gulf States and central valleys, southerly; in the Lake region, Rocky Mountain districts, and on the Pacific coast they were variable.

HIGH WINDS (in miles per hour).

Wind-velocities of fifty or more miles per hour, (on mountain stations at or exceeding seventy miles) other than the maximum velocities for the month, which are given in the table of miscellaneous data:

Fort Totten, Dak., 50, s., 26th.

Pike's Peak, Colo., 72, sw., 5th; 72, w., 26th.

Mount Washington, N. H., 72, w., 16th; 70, nw., 17th.

LOCAL STORMS.

Pamplin City, Appomattox Co., Va.: a destructive hail and wind storm passed over this section on the afternoon of the 1st; it appears to have been most severe at a point five miles west of this place, where the crops were seriously injured.

Charlotte, N. C.: quite a severe storm, accompanied by hail, occurred at this place between 5 and 6 p. m. on the 1st. The wind attained a maximum velocity of forty miles per hour at 5.28 p. m.

Knoxville, Tenn.: heavy rain, with hail at intervals, fell from 11.15 a. m. to 12.20 p. m., and from 1.40 to 5.25 p. m. on the 1st. This storm was the severest that has occurred at this place during the current year, and considerable damage was done to crops in the surrounding country.

Marquette, Mich.: the storm which occurred during the night of the 7-8th caused considerable damage to streets, sewers, and unfinished buildings in this city.

Mr. A. Pendleton, voluntary observer at Nicolans, Sutter Co., Cal., furnishes the following report of a hail storm of remarkable severity which occurred at that place on the 12th:

The hail storm of the 12th was the most violent and disastrous that ever occurred here. The length of time during which hail was precipitated was over three hours (beginning at 1.30 p. m.), a feature of the storm which, also, has no precedent in this vicinity, if in the state. When done falling nothing in the shape of vegetation was free from the traces of the storm. Whole fields of barley were stripped entirely clean of the heads, and nothing was left standing but the bare straw. In other fields the grain was knocked flat to the ground, with only, here and there, a head remaining on the stalk. With wheat fields the effect was the same, except that the destruction was not quite so complete, owing, most likely, to its being not quite so far advanced as the barley. What fruit was not pounded off the trees was picked full of holes, so that it resembled the effect of a charge of shot. Corn was stripped as with a knife, and every sort of vegetable suffered. Chickens, birds, rabbits, gophers, young pigs, etc., were found lifeless in quantities after the storm.

The temperature rapidly fell to 50°, and the ground soon became white with hail. For two hours the hail and rain continued to fall with unabated vigor

until it lay three inches deep on the ground, and the streets were like rivers. In places like the intersection of roofs the hail piled up to the depth of eighteen inches, and could have been gathered by the ton. It varied in size from peas to walnuts, and was of all shapes, and generally bearing the characteristic, noticed before, of being frozen solid on one side and imperfectly congealed on the other.

At 3 p. m. an attempt was made to reach the rain-gauge, which is situated on a roof twenty-four feet from the ground. But the wind (which at that time had increased to sixty miles per hour), rain, and hail drove the observer back, but not until he had seen the gauge full and running over. Its capacity is 1.70 inches, so more than that amount had fallen in an hour and a half. It is safe to say that the amount precipitated during the storm was three inches, nearly an inch an hour for the three and a half hour's fall. The wind during the last hour fell to fifteen miles, and hauled to east, the temperature rising at 4 p. m. to 53°.

Observers situated a mile or more from the river saw two clouds, one seemingly above the other, which came together over the town and adjacent country at the time of the greatest fall. For a distance of five miles below town to the same distance above, the hail was felt in its severity, extending back from the river a varying distance of from a half a mile to two miles. Nearly every growing thing in the limits of this district suffered more or less, the loss, in all probability, reaching \$50,000. It is fortunate that the storm spent its fury before reaching the extensive wheat fields east of the river, as the damage would have been incalculable. Most of them got a severe drenching, but escaped with a loss variously estimated at from five to ten per cent. and the delay of harvesting it. Doubtless the storm will go on record as the severest ever experienced in California in the month of June.

Dodge City, Kans.: a thunder-storm began at 6 p. m. on the 16th and continued until 10.20 p. m. The rainfall was very heavy, amounting to 3.00 inches in two hours and forty minutes, and caused much damage by flooding streets and cellars. Small hail fell at intervals during the storm.

Port Huron, Mich.: from 5.10 to 9.20 p. m. on the 17th a thunder-storm, accompanied by hail, prevailed at this place, the wind reaching a maximum velocity of thirty-six miles per hour, from the west, at 5.54 p. m. Several windows were broken by the hail in this city, and farmers from the surrounding country state that crops were considerably injured by hail.

Hudson, Lenawee Co., Mich.: a very severe wind storm from the northwest occurred during the afternoon of the 17th, causing much damage to trees.

Henry, Codington Co., Dak.: gardens and crops to the east of this place were damaged by a hail storm which occurred on the 18th.

Baltimore, Md.: a severe storm, accompanied by hail and high wind, occurred between 4 and 5 p. m. on the 18th. About half an inch of rain fell in a few minutes, causing some light damage.

Petersburg, Va.: reports from Northampton county, N. C., state that during the night of the 18-19th a violent storm caused much damage in that county to fruit trees, fences, barns, and other out-buildings. The very heavy rain caused much injury to crops.

Elkton, Cecil Co., Md.: a severe thunder-storm, accompanied by hail, occurred in the upper part of this county during the night of the 19-20th. Hail fell in sufficient quantity to cover the ground. Several buildings were struck by lightning, and considerable damage was done to crops.

Massey, Kent Co., Md.: a thunder-storm, accompanied by hail, occurred at Millington and vicinity, in this county, during the evening of the 19th. Considerable damage was done by lightning.

Lebanon, Lebanon Co., Pa.: A violent storm of rain and hail passed over this county during the evening of the 19th; it was especially severe along the line of the Lebanon Valley Railroad, between Richland and Myerstown. At the former place hail-stones fell which measured one and a half inches in diameter, and in the vicinity of Myerstown trees were uprooted and the roads badly washed. Great damage was done to crops.

Lancaster, Lancaster Co., Pa.: between 5 and 6 p. m. on the 19th a violent rain and hail storm prevailed in this city and

Report of tornadoes for the month of June, 1887, by 2d Lieutenant John P. Finley, Signal Corps, Assistant.

Place.	Date.	Time.	Direction.	Form of cloud.	Number of persons killed.	Number of persons wounded.	Width of path in feet.	Number and kind of animals killed.	Number and kind of buildings destroyed.	Total valuation of property destroyed.	Authority.
Green county, Tenn. <i>a</i>	1	Afternoon	ne.	Funnel	None.	2	450		30, mostly barns and out-buildings.		Knoxville, Tenn., "Journal."
Carroll and Campbell counties, Ga. <i>b</i>	1	7.10 p. m.	e.	Funnel	None.	2	300 to 450		Many buildings		M. B. Russell, Carrollton, N. H. Ballard, Palmetto, C. B. Brogden, Brogden, Ga.
Near Newnan, Ga. <i>c</i>	1	7 to 8 p. m.	ne.	Funnel	1	1	100 to 900	1 cow.	11 buildings		J. E. Willett, Macon, Ga.
Brunswick, N. C. <i>c</i>	1	4 to 5 p. m.	ne.		None.	None.	2,640	Several head of cattle.	Demolished barns and fences, twisted off trees.		Mattie C. Chamness, Brunswick, N. C.
Green district, W. Va. <i>d</i>	1	7 p. m.	ne.				5,280		Very destructive to timber.		E. E. Headlee, Porter's Falls, W. Va.
Brackettown, N. C. <i>d</i>	1	Evening	se.			Several	300		Several houses, timber prostrated, and crops ruined.		A. L. Grayson, Rutherfordton, N. C.
Cove Mountain, Pa. <i>e</i>	2	Morning	w. of n.				300		Destroyed everything in its path.		J. S. Shade, McConnellsburg, Pa.
Near Belvidere, N. C. <i>e</i>	2	9 p. m.	ne.	Funnel	None.	None.	300 to 450		Unroofed buildings, twisted off trees 18 to 24 inches in diameter.		J. Nicholson, Belvidere, N. C.
Shawneetown, Ill. <i>f</i>	3		ne.		3		Narrow		One		C. J. Lemen, Shawneetown, Ill.
Near Lead Hill, Ark. <i>g</i>	4	4.30 p. m.	ne.	Funnel			300 to 1,320		Twisted off trees and caused great destruction when ever it struck the ground.		S. C. Turnbo, Pro Tem, Mo.
Blue Creek, W. Va. <i>h</i>	5		ne.	Funnel	None.	None.	Narrow	1 horse	Several houses.		N. A. Duffield, Rock Castle, W. Va.
Near Waco, Tex. <i>i</i>	6	Afternoon			None.	None.	150		Demolished several houses.		L. M. Kingsley, Bosqueville, Tex.
Twelvemiles north of Jamestown, Dak. <i>j</i>	6	5 p. m.	ne.	Funnel	None.	None.	Narrow		No buildings in track.		R. A. Bill, Jamestown, Dak.
Twelve miles northeast of Huron, Dak. <i>j</i>	7	3.10 p. m.	ne.	Funnel							Signal Service observer, Huron, Dak.
Salina, Kans. <i>k</i>	8	5 p. m.	ne.				Narrow	1 horse and a large number of poultry.	1 dwelling, several barns		Dr. J. F. Llewellyn, Mexico, Mo.; J. N. Gibson, Salina, Kans.
Kansas City, Mo. <i>l</i>	10	9.30 a. m.	ne.	Funnel							"New York World," June 11, 1887.
McDowell county, N. C. <i>l</i>	13		ne.	Funnel					Several houses demolished and fences and prostrated.		L. B. Schmidt, Le Roy, Kans.
Grand Forks, Dak. <i>m</i>	16	3.22 p. m.	easterly		4				50 or more buildings, besides hundreds of barns, out-houses, &c.	\$150,000	M. B. Young, Grand Forks, I. N. Johnson, Milan, W. E. Boise, Bellevyria, Dak.
Maywood, N. C. <i>m</i>	18	3 p. m.	se.	Funnel	None.	None.	5,280		Very destructive to crops.		A. T. Smith, Maywood, N. C.
Keystone, Minn. <i>n</i>	18	10.30 a. m.	e.						Timber prostrated.		Alex. Jorgenson, Keystone, Minn.
Falun, Kans. <i>n</i>	20	5.30 p. m.	ne.	Funnel	None.	None.	47		No damageable property in path.		J. N. Gibson, Salina, Kans.
Saline, Mo. <i>o</i>	20	5.15 p. m.	ne.	Funnel	None.	5			Very destructive to buildings, orchards, and crops.	68,000	H. B. Collins, Saline, Mo.
Nottoway and Amelia counties, Va. <i>p</i>	21		ne.		None.	None.			Granaries, barns, and out-buildings destroyed, orchards ruined, and timber prostrated.		Baltimore "Sun," June 23, 1887.
Killeen, Tex. <i>p</i>	21	10 p. m.	south'y		None.	None.			School-house, Masonic hall, and several dwellings.		W. P. Powell, Holland, Tex.
Wilmington, Del. <i>p</i>	22	12.40 p. m.	ne.	Funnel	3	Several	Narrow		17 buildings totally destroyed and 38 badly damaged.		W. A. Eddy, New York City; "New York Times."
West Almond, N. Y. <i>q</i>	24	6.10 a. m.	ne.		None.	None.					Dr. C. H. Sharp, West Almond, N. Y.
Longview, Tex. <i>q</i>	26	Evening	ne.	Funnel	8				Several houses.		"Globe Democrat," Saint Louis, Dr. J. F. Llewellyn, Mexico, Mo.

a Cloud approached with a loud roar.

b The cloud appeared to be above forty feet wide at the top and one hundred feet high, tapering to a point at the bottom, moving at a rapid pace with a roar.

c Cloud formed in the southwest and moved rapidly.

d A revolving, black cloud, moving with a roaring noise.

e Cloud accompanied by a terrific roar.

f Cloud very angry looking.

g The funnel cloud was of a white, milky color and moved rapidly.

h Cloud very black and moved rapidly.

i Three funnel-shaped clouds projected from a bank, the sky being perfectly clear on all sides of the main cloud; five minutes later a pipe-like cloud seemed to rise from the earth to the funnel-shaped cloud. The column was at first narrow, but gradually began to widen, first at the ground and then at the upper end.

j Cloud did not reach the earth at this point.

k A tuft of lead-colored cloud rose from a black stratum, whirling rapidly, and met with a jet from above. After the rotary motion had continued for some time the funnel-shaped cloud broke and disappeared; it did not touch the earth.

l A black cloud, accompanied by a deafening roar.

m A whitish colored, funnel-shaped cloud of great length, projecting from a bank of cloud, swaying back and forth, accompanied by a roaring noise.

n The cloud seemed to sweep the ground, and advanced, whirling at a fearful rate, but its movement of progression was slow.

o The clouds moved rapidly from all directions toward the tornado cloud, which was revolving rapidly, raising and lowering alternately. The lower end of the funnel was streaked with green, bordered on each side by red bands.

p A dark, funnel-shaped cloud formed in the southwest, with a curiously shaped cloud on either side; the three clouds joined, when a great commotion ensued, the entire mass moving off at a furious velocity.

q Cloud intensely black, about one-half mile in width; it did not touch the earth, but had a rotary motion.

vicinity, causing great damage. The hail-stones were as large as walnuts and fell for nearly half an hour. The various crops and fruit were much injured, and hundreds of panes of glass were broken.

Easton, Pa.: during the evening (about 10 p. m.) of the 19th a destructive storm occurred in this vicinity. Trees were uprooted, and the heavy rainfall caused much injury to the roads and growing crops. Considerable damage was done by lightning.

Wilkesbarre, Pa.: a severe storm of rain and hail prevailed here during the afternoon of the 19th, causing considerable damage to crops in the surrounding country. In the northern part of Wilkesbarre a large frame building was destroyed.

Reading, Pa.: a severe storm passed over this section during the night of the 19-20th. The heavy rains caused the flooding of many cellars, and in the surrounding country the grain fields were levelled and fruit was severely cut by hail. The storm was accompanied by a very remarkable electrical display.

Booneville, Cooper Co., Mo.: the heaviest rain storm of the season occurred here at about 10 p. m. of the 20th, the rainfall amounting to over three inches. Growing corn in many parts of the county was blown down, and wheat was also damaged.

Cleveland, Ohio: the steam barge "P. H. Walters" was sunk off Black River, Ohio, during a severe squall on the evening of the 20th.

Raleigh, N. C.: during the prevalence of a severe thunder-storm on the 20th there was a fall of hail about four miles north of this place, causing considerable damage to the cotton and corn crops. The path of the hail belt was about one mile wide, within which the cotton was stripped of its leaves and corn badly torn.

Henderson, Vance Co., N. C.: during the night of the 20th-21st quite a severe storm passed through the "Bear Pond" section of this county; houses, fences, and trees were blown down.

Mr. L. J. Heatwole, voluntary observer at Dale Enterprise, Rockingham Co., Va., furnishes the following report of a storm which occurred at that place:

At 4.30 p. m. on the 20th a dark, ominous looking cloud was seen forming high up in the western sky, and was accompanied by a loud roaring noise, which resembled that made by an approaching railroad train. It apparently remained stationary for about forty minutes and then drifted slowly eastward, at which time began a tremendous downpour of rain and some hail. The bulk of the storm passed just to the south of this point, and to all appearances the wind came in a direction downward and outward from the sides of the cloud, with a force so great as to destroy much fencing and timber, and also to overturn wind-engine towers and buildings along its track. At this station the wind blew a heavy gale from the south and southeast, while two miles to the south, on the opposite side of storm, the current was so violent from the north and west as to completely demolish a large barn. The lightning was sharp and

frequent; in one instance a barn eight hundred yards or more from the station received a heavy discharge of lightning that killed two horses in the stables.

New Orleans, La.: on the 20th thunder-storms prevailed from 2.20 to 6.15 p. m., and from 8.10 to 9 p. m. The rainfall, amounting to 5.00 inches, which accompanied this storm flooded a large part of the city and caused much damage. The rainfall was the heaviest that has occurred since April 7, 1883.

Lenoir, Caldwell Co., N. C.: a destructive hail storm occurred in this vicinity on the 21st; the hail-stones were as large as hens' eggs and caused great damage to crops.

Rock Hall, Kent Co., Md.: a storm of unusual severity, accompanied by hail, occurred in this vicinity during the night of the 21st-22d, causing much damage to orchards, crops, and other property.

Petersburg, Dinwiddie Co., Va.: a storm, reported to have been the most severe experienced for many years, passed through Amelia and Nottoway counties on the 22d. Dwellings were unroofed, and out-buildings, fences, and trees were blown down. In Dinwiddie county crops were severely injured by a heavy fall of hail.

Salisbury, Wicomico Co., Md.: a violent storm occurred in this vicinity at about 9 p. m. on the 22d. Much damage was done by the very heavy rainfall and high wind.

Wilmington, Del., 22d: two storms of unusual violence occurred here during the early morning of the 22d, the more violent coming from the southwest. Many trees, chimneys, and light structures were blown down, and several buildings were unroofed. Great damage was done to telegraph and telephone wires.

Philadelphia, Pa.: thunder-storms occurred during the early morning and afternoon of the 22d and continued during the night of the 22d-23d. Rain fell at intervals during this time, but at 7.45 p. m. a steady downpour set in and continued during the night, the rainfall amounting to 3.63 inches, which is remarkably heavy for this station.

Valentine, Nebr.: on the 26th a thunder-storm began at 6.45 p. m. and continued until 8.45 p. m.; hail fell for five minutes, beginning at 7 p. m. The wind attained a very high velocity; for two and one-half minutes it blew at the rate of one hundred and fifty miles per hour. The roofs were blown from several buildings and a number of frame structures were blown down.

WATER-SPOUTS.

Captain Frank, of the s. s. "Taormina," reports having observed two water-spouts on June 21st, in N. 41° 20', W. 61° 28', at noon.

First Officer James Ryley, of the s. s. "Lampasas," Captain Crowell, commanding, reports having observed three water-spouts June 26th, in N. 33° 00', W. 77° 50', at noon.

COTTON REGION REPORTS.

In the following table are given the means of the maximum and minimum temperatures, and the average rainfall for the cotton-belt districts during the month. For the purpose of comparison the means for the five preceding years are also given.

Generally the rainfall is deficient in all districts, the departures ranging from 0.58 inch in the district of Vicksburg to 3.13 inches in the district of Charleston, while they exceed two inches in the districts of Atlanta, Little Rock, Memphis, Montgomery, and Savannah; in the district of Galveston a small excess occurs.

The mean maximum temperatures are above the average in all districts, except in the districts of Galveston and Little Rock, which show slight departures below the average. The mean minimum temperatures are slightly below the average in all districts, except for the district of Galveston, where a small excess occurs.

A comparison of the means of the maximum and minimum temperatures shows that the absolute range of temperature during June, 1887, in the southern sections of the country was greater than the average of previous years.

Temperature and rainfall data for the cotton districts, June.

Districts.	Rainfall.			Temperature.								Extremes for June, 1887.	
	Average for June of five preceding years.	Average for June, 1887.	Departures.	Maximum.			Minimum.						
				Mean for June of five preceding years.	Mean for June, 1887.	Departures.	Mean for June of five preceding years.	Mean for June, 1887.	Departures.				
Inch.	Inch.	Inch.	°	°	°	°	°	°	°	°	Max.	Min.	
New Orleans...	5.90	5.27	-0.63	90.5	91.0	+0.5	70.5	68.6	-1.9	101	57		
Savannah.....	6.28	3.91	-2.37	89.7	90.6	+0.9	69.6	68.2	-1.4	104	48		
Charleston.....	6.54	3.41	-3.13	88.3	90.2	+1.9	67.4	66.0	-1.4	105	44		
Atlanta.....	5.61	3.56	-2.05	87.0	89.1	+2.1	66.0	65.2	-0.8	104	43		
Wilmington....	5.59	3.98	-1.61	87.2	88.4	+1.2	65.3	64.4	-0.8	109	42		
Memphis.....	4.90	2.54	-2.36	87.4	88.9	+1.5	66.5	63.7	-2.8	102	44		
Galveston.....	2.58*	3.27	+0.69	92.1*	91.4	-0.7	70.2*	70.3	+0.1	103	56		
Vicksburg.....	4.19	3.61	-0.58	89.9	91.3	+1.4	69.2	69.0	-0.2	101	52		
Montgomery....	2.25	2.84	+0.59	89.2	90.2	+1.0	67.5	66.9	-0.6	104	47		
Augusta.....	5.61	3.85	-1.76	88.6	91.0	+2.4	66.9	66.4	-0.5	105	48		
Little Rock....	3.37	1.26	-2.11	89.1	88.6	-0.5	65.9	64.9	-1.0	100	43		
Mobile.....	4.78	3.79	-0.99	91.0	91.6	+0.6	69.7	65.4	-4.3	105	46		

*Average for June of four preceding years.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

In the following table are shown the danger-points at the various river stations and the highest and lowest depths for June, 1887, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, June, 1887.

[Expressed in feet and tenths.]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La.	29.9	1	15.5	30	12.2	3.3
<i>Arkansas River:</i>						
Fort Smith, Ark.	22.0	18	9.3	28, 29	4.4	4.9
Little Rock, Ark.	23.0	20	8.8	30	4.4	4.4
<i>Missouri River:</i>						
Omaha, Nebr.	18.0	29	14.9	1, 2, 3	8.9	6.0
Leavenworth, Kans.	20.0	14, 15	17.0	1	10.7	6.3
<i>Mississippi River:</i>						
Saint Paul, Minn.	14.5	1, 24	3.4	10-14, 18, 19, 29, 30	2.7	0.7
<i>La Crosse, Wis.</i>	24.0	17 to 20	5.3	8, 9, 12, 13, 30	4.5	0.8
Dubuque, Iowa.	16.0	1	5.6	15, 16, 17	4.3	1.3
Davenport, Iowa.	15.0	1	4.0	16, 26	2.8	1.2
Keokuk, Iowa.	14.0	1	4.4	14, 20, 21, 22	2.6	1.8
Saint Louis, Mo.	32.0	18	18.0	5	11.7	6.3
Calta, Ill.	40.0	20	23.1	6	15.1	8.0
Memphis, Tenn.	34.0	21, 22	18.6	8	12.6	6.0
Vicksburg, Miss.	41.0	1	24.9	13, 14	15.9	9.0
New Orleans, La.	13.0	1	10.0	18	5.8	4.2
<i>Ohio River:</i>						
Pittsburg, Pa.	22.0	8	13.3	29	1.5	11.8
Cincinnati, Ohio.	50.0	13	20.5	25, 30	8.4	18.1
Louisville, Ky.	25.0	14	10.0	30	4.9	5.1
<i>Cumberland River:</i>						
Nashville, Tenn.	40.0	17	12.2	29, 30	1.8	10.4
<i>Tennessee River:</i>						
Chattanooga, Tenn.	33.0	8	10.4	30	3.7	6.7
<i>Monongahela River:</i>						
Pittsburg, Pa.	29.0	8	13.3	29	1.5	11.8
<i>Savannah River:</i>						
Augusta, Ga.	32.0	3	17.3	19, 20, 21	5.8	11.5
<i>Sacramento River:</i>						
Sacramento, Cal.		1 to 4	18.3	28, 29	10.7	7.6
<i>Willamette River:</i>						
Portland, Oregon.		21	25.7	12	22.0	3.7

The range of water in the Mississippi did not exceed two feet at stations north of Keokuk, Iowa; the maximum range occurred between Saint Louis, Mo., and Vicksburg, Miss., where it varied from six to nine feet.

In the Ohio River the range of water varied from 5.1 feet at Louisville, Ky., to 18.1 feet at Cincinnati, Ohio.

The following notes on navigation, etc., have been reported:

Mississippi River.—Keokuk, Iowa: on the 21st the river was so low that boats ran very irregularly. The "Bart E. Lineham," with a raft of logs, was one week in making the trip from Keokuk to Quincy, a distance of thirty-five miles.

Cumberland River.—Nashville, Tenn.: on the 19th navigation was suspended, owing to the low stage of water.

Ohio River.—Pittsburg, Pa.: navigation suspended on account of low water on the 29th.

Oswegatchie Lake.—Oswego, N. Y.: at the close of the month the water in the lake was so low that the flouring mills were obliged to use steam.

FLOODS.

Fort Custer, Mont.: on the 2d the water in the Big Horn River reached the highest stage that has occurred since 1880; on the 17th the Yellowstone River was also higher than at any time during the period mentioned.

Kansas City, Mo.: between 5 and 6 p. m. on the 3d a violent rain and thunder-storm occurred at this place. The yards of the Missouri Pacific Railroad were flooded and considerable damage was done throughout the city. Passengers on incoming trains on the Kansas City, Fort Scott, and Gulf Railroad report having passed through a severe wind storm fifteen miles south of Kansas City. Much damage by lightning was reported from eastern Kansas and adjacent portions of Missouri during these storms.

Oberlin, Lorain Co., Ohio: the flood which resulted from the

very heavy rain storm of the 5th caused much damage. The streets were flooded, and several bridges were washed away.

Grafton, Lorain Co., Ohio: a violent storm occurred at this place on the 5th. The rainfall was very heavy and flooded the streets of the town and entered the cellars and lower floors of a number of buildings. A large culvert on the Cleveland, Lorain, and Wheeling Railroad was washed out.

Berea, Cuyahoga Co., Ohio: the very heavy rain of the 5th caused the most destructive freshet in Rocky Creek that has been known for fifteen years. The water rose six feet in less than two hours and overflowed the quarries in this vicinity. The superintendent of the Cleveland Stone Company states that the losses sustained by that company will amount to \$100,000.

Johnstown, Cambria Co., Pa.: a very heavy rainfall occurred to the west of Hooversville, Somerset Co., on the 7th. That village was entirely under water and more than twenty residences were washed from their foundations. The flood reached this place (Johnstown) about noon, and during the afternoon the streets and a number of cellars were flooded and large quantities of drift floated past. Much damage was done by the flood at Conemaugh, Morrillville, Grubtown, Cambria City, and Coopersdale, in Cambria Co., and at Minersville, Schuylkill Co.; several bridges were washed away. The damage is estimated at \$150,000.

Wilkesbarre, Pa.: a very heavy rain storm occurred at Nanticoke and vicinity, in Luzerne Co., on the afternoon of the 9th, flooding the streets and cellars and causing a large amount of damage. The first floors of a number of houses were submerged, and in some instances the buildings were undermined. Considerable injury was also done to the railroads in this vicinity. The losses are estimated at \$100,000.

Wheeling, West Va., 10th: the very heavy rains since the 1st of the month have caused great injury to crops throughout this state and in adjacent portions of Ohio. A number of bridges were washed away, causing delay on railroads.

Tecumseh, Johnson Co., Nebr.: the Nemaha River and all other streams in this county were much swollen on the 13th.

Key West, Fla.: rain began to fall during the early morning of the 15th, and continued at intervals until 9.50 p. m., when the precipitation amounted to 3.57 inches. This is the largest rainfall on the records of the signal office for the month of June, although heavier rainfalls have occurred in other months.

Brownsville, Tex.: from the 15th to 22d more than eleven inches of rain fell at this place. This very heavy rainfall has caused much damage to the crops in this region, especially to corn.

Atlantic City, N. J.: very heavy rain fell at intervals during the 22d, flooding the streets and causing considerable damage.

Lawrence, Mass.: on the 25th the Merrimac River rose more than ten feet, and the freshet was the most remarkable ever known at this place. The water rose to within two feet of the temporary bridge recently built across the river and it was feared that the structure would be swept away. A large number of logs were swept past the city.

Savannah, Ga.: very heavy rain fell at this place on the 27th and 28th, the total precipitation amounting to 7.60 inches. This rain storm was one of the heaviest that has occurred at this place since the establishment of the signal office. It is not thought that the crops in this vicinity were seriously damaged, as the ground was very dry previous to the rain.

Pensacola, Fla.: on the 28th thunder-storms, with showers, occurred at intervals during the day; heavy rain set in at 8.10 p. m. and continued throughout the night and morning of the 29th. The rainfall during the twenty-four hours ending at 3 p. m. of the 29th amounted to 10.70 inches, which is the heaviest shown by the records of the signal office at this place. The city and suburbs were flooded, and many washouts occurred on railroads entering this place.

HIGH TIDE.

Chincoteague, Va., 11th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

No extended auroral displays occurred during June; although reported on numerous dates the displays were not specially brilliant or widely observed.

The following are descriptions of the more important auroras of the month:

Albany, N. Y., 3d: an auroral light was observed at 10.05 p. m., consisting of an arch and "merry dancers," extending to altitude 40°, and from azimuth 135° to 250°; the display ended at 10.40 p. m.

Northfield, Vt., 9th: an auroral light was observed at 8.45 p. m., consisting of streamers rising to an altitude of 35° and extending over 60° of the horizon; the aurora was very brilliant at 9.30 p. m.; the display ended at 11 p. m. On the 20th an auroral arch was observed from 8.30 to 9.45 p. m., extending to altitude 25°, and covering 50° of the horizon; the display reached its maximum brilliancy at 9.30 p. m., after which it rapidly disappeared.

Duluth, Minn., 18th: auroral beams were visible at 10.20 p. m., and increased in brightness until 11.45 p. m., at which time an irregular arch was formed, near the centre of which a few streamers shot upward; the arch was poorly defined and lasted but a few minutes; the display ended at 1.30 a. m. on the 19th.

Port Huron, Mich., 26th: an auroral light was observed from 1.30 a. m. until daylight; it was again visible at 10 p. m., and continued until 2 a. m. of the 27th; the display extended to altitude 30° and over 90° of the horizon, and had the appearance of the break of day.

The voluntary observer at Egg Harbor City, N. J., reports having observed auroras on the following dates: 10th to 15th, 20th, 27th; only one of these displays was noted by other observers in New Jersey.

Auroras were noted on other dates, as follows:

- 1st and 3d.—Pekin, Ill.
- 5th.—Pekin, Ill.; Embarras, Wis.
- 9th.—Moorhead, Minn.; Ithaca, N. Y.
- 10th.—Escanaba, Mich.; Clayton, N. J.
- 11th.—Mount Washington, N. H.
- 14th.—Reidsville, N. C.
- 16th.—Parksburg, W. Va.
- 17th.—Alpena, Mich.
- 18th.—Fort Totten, Dak.
- 19th.—Mackinaw City, Mich.
- 21st.—Madison, Wis.
- 22d.—Fort Totten, Dak.
- 26th.—Erie and Wilkesbarre, Pa.
- 28th.—Pekin, Ill.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various states and territories on the several dates, as follows:

1st.—Alabama, Arizona, California, Florida, Georgia, Illinois, Indiana, Kansas, Louisiana, Maryland, Michigan, Nebraska, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Wisconsin, Wyoming.

2d.—Arkansas, California, Colorado, Connecticut, Dakota, Florida, Georgia, Indian Territory, Kansas, Louisiana, Maryland, Massachusetts, Missouri, Mississippi, New Hampshire, New Jersey, New York, New Mexico, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia.

3d.—Arkansas, Dakota, Florida, Georgia, Illinois, Indian Territory, Iowa, Kansas, Maine, Massachusetts, Mississippi, New Hampshire, New Mexico, North Carolina, South Carolina, Tennessee, Texas, Utah, Vermont, Washington Territory.

4th.—Colorado, Florida, Georgia, Illinois, Indiana, Iowa, Indian Territory, Kansas, Kentucky, Louisiana, Michigan, Missouri, Mississippi, Montana, North Carolina, Ohio, South Carolina, Tennessee, Texas, Utah, Wisconsin, Wyoming.

5th.—Arkansas, Dakota, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Montana, New Jersey, New York, Ohio, Tennessee, Texas, Virginia, West Virginia.

6th.—Arkansas, Dakota, Georgia, Illinois, Indiana, Iowa, Indian Territory, Kansas, Kentucky, Louisiana, Michigan, Missouri, Montana, Nebraska, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Virginia, West Virginia.

7th.—Arkansas, Dakota, Delaware, Florida, Illinois, Indiana, Iowa, Indian Territory, Kansas, Kentucky, Michigan, Missouri, Maryland, Mississippi, Minnesota, Nebraska, New Jersey, North Carolina, New Mexico, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia, Wisconsin, Wyoming.

8th.—Arkansas, Colorado, Dakota, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Missouri, Mississippi, Montana, Nebraska, New Jersey, North Carolina, New York, New Mexico, Ohio, Pennsylvania, South Carolina, Texas, Virginia, West Virginia, Wisconsin.

9th.—Arkansas, Connecticut, Colorado, Dakota, Florida, Georgia, Illinois, Indiana, Iowa, Indian Territory, Idaho, Kansas, Kentucky, Louisiana, Montana, Maryland, Massachusetts, Michigan, Missouri, Nebraska, New Jersey, New Mexico, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, Washington, West Virginia.

10th.—Arkansas, Colorado, Dakota, Florida, Indian Territory, Missouri, Mississippi, Montana, Nebraska, New Jersey, New York, North Carolina, Rhode Island, South Carolina, Texas, Tennessee, Wyoming.

11th.—Arkansas, California, Colorado, Dakota, Florida, Georgia, Iowa, Indian Territory, Kansas, Louisiana, Missouri, Mississippi, Montana, Nebraska, South Carolina, Texas, Tennessee, Washington.

12th.—Arkansas, California, Colorado, Dakota, Idaho, Iowa, Indian Territory, Kansas, Louisiana, Mississippi, Montana, Nebraska, Pennsylvania, Texas, Tennessee, Washington.

13th.—Colorado, Florida, Iowa, Indian Territory, Kansas, Montana, Nebraska, Texas, Wisconsin.

14th.—Colorado, Dakota, Florida, Iowa, Idaho, Montana, Minnesota, New Mexico, Ohio, Wyoming.

15th.—Dakota, Florida, Minnesota, Montana, New Mexico, Texas, Wyoming, Washington.

16th.—Dakota, Florida, Kansas, Michigan, Minnesota, New Hampshire, New York, Texas, Wisconsin.

17th.—Delaware, Florida, Illinois, Indian Territory, Montana, Maryland, Michigan, New Jersey, New York, Ohio, Pennsylvania, Wisconsin.

18th.—Arizona, Connecticut, Dakota, Florida, Indiana, Illinois, Iowa, Minnesota, Maryland, Massachusetts, Michigan, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, Tennessee, Wisconsin.

19th.—Arizona, Colorado, Connecticut, Dakota, Florida, Georgia, Illinois, Indiana, Iowa, Maryland, Michigan, Minnesota, Nebraska, North Carolina, New York, New Jersey, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia.

20th.—Alabama, Arkansas, California, Colorado, Dakota, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Mississippi, Montana, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Tennessee, Virginia, West Virginia, Wisconsin.

21st.—Arkansas, Connecticut, California, Florida, Georgia, Illinois, Iowa, Kentucky, Louisiana, Missouri, Mississippi, Maryland, Maine, Michigan, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, Virginia, West Virginia.

22d.—Arizona, Colorado, California, Connecticut, Florida, Georgia, Idaho, Indiana, Michigan, Maine, Massachusetts,

Missouri, Maryland, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Oregon, Ohio, Pennsylvania, South Carolina, Vermont, Virginia.

23d.—Colorado, Florida, Indian Territory, Kansas, Massachusetts, Montana, New Hampshire, New Jersey, New York, South Carolina, Texas, Utah, Virginia.

24th.—Arkansas, California, Connecticut, Colorado, Dakota, Florida, Indian Territory, Kansas, New Jersey, Nevada, Pennsylvania, South Carolina, Texas.

25th.—Arizona, Colorado, Dakota, Florida, Indian Territory, Maine, Montana, North Carolina, South Carolina, Texas.

26th.—Arizona, Arkansas, Dakota, Florida, Georgia, Indian Territory, Louisiana, Missouri, Mississippi, New Mexico, New York, Pennsylvania, Texas, Wyoming.

27th.—Arizona, Arkansas, Colorado, Dakota, Florida, Georgia, Iowa, Louisiana, Mississippi, Minnesota, Nebraska, Pennsylvania, Tennessee, Texas, Wyoming.

28th.—Arizona, Colorado, Dakota, Florida, Kansas, Louisiana, Montana, Nebraska, New Mexico, Pennsylvania, Tennessee, Texas, Utah.

29th.—Arizona, Colorado, Dakota, Florida, Kansas, Louis-

iana, Minnesota, Montana, Missouri, New Mexico, Maine, Pennsylvania, Wyoming.

30th.—Arizona, Arkansas, Alabama, Colorado, Dakota, Florida, Illinois, Iowa, Kansas, Louisiana, Minnesota, Montana, Missouri, Michigan, Massachusetts, Maine, Nebraska, Tennessee, Texas, Wisconsin, Wyoming.

ELECTRICAL PHENOMENON.

Pike's Peak, Colo.: during the prevalence of a sleet and thunder-storm on the 23d a hissing noise was heard about the iron joists around the station, and also about the anemometer. On going near the latter a strong electrical shock was felt, which caused a twitching of the muscles of the face and hands, and the hair of the head to stand on end. The cups of the anemometer seemed surrounded by an almost imperceptible cloud. By standing in any place where the building did not shelter from the wind, and by pointing a finger, would cause the same hissing sound to issue from the end of the finger and a current would be felt. The display was unaccompanied by light of any kind and could only be distinguished by the hissing noise and the sensation; it continued about fifteen minutes.

OPTICAL PHENOMENA.

HALOS.

1st-4th.—On the 1st solar and lunar halos were observed at a number of stations on the middle Atlantic coast and at scattering stations in the Gulf States, Ohio Valley, and Lake region; on the 2d lunar halos, only, were reported from the central Mississippi valley, middle, south Atlantic, and Gulf coasts, and at a few stations in the Missouri and Ohio valleys, west Gulf states, and southern plateau, while both solar and lunar halos were noted in the north Pacific coast region; on the 3d and 4th solar and lunar halos were reported from scattering stations from the Lake region southward to the Gulf coast. During this period the area of low pressure described as number ii passed from the central Ohio valley northward over the Lake region, Saint Lawrence Valley, and off the Atlantic coast, attended by cloudy and rainy weather in the districts named.

4-9th.—But a few stations reported halos during this period, and those were mostly in the districts east of the Mississippi; solar halos were, however, observed at several stations in California on the 7th.

10-11th.—On these dates halos, mostly solar, were observed in the upper lake region, upper Mississippi valley, northern plateau, and middle Pacific coast, while areas of low pressure existed in the central and northern Rocky Mountain districts, attended by cloudy or rainy weather.

12-13th.—On these dates cirrus and cirro-stratus clouds cov-

ered the Lake region and middle Atlantic states, and numerous solar halos were observed in these districts.

14-26th.—This period was comparatively free from halos; they were seldom observed, and only at scattering stations.

27-30th.—Cirrus and cirro-stratus clouds were observed from the Lake region and Ohio Valley eastward to the Atlantic coast on the 27th and 28th, and solar and lunar halos were noted at numerous stations in this region on these dates. On the 29th and 30th a few stations in the upper lake region and upper Mississippi valley reported solar and lunar halos.

The phases of the moon, Washington mean time, during June, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: New moon, 20th, 17 h. 44.6 m.; first quarter, May 29th, 12 h. 11.4 m.; full moon, 5th, 5 h. 29.9 m.; last quarter, 12th, 20 h. 26.6 m.; perigee, 1st, 18.2 h.; apogee, 13th, 18.9 h.

MIRAGE.

The following is from the "New York Times" of June 19th:

PALMYRA, N. Y., June 18th.—A fine mirage, the second that has appeared in two months, was seen here to day. Lake Ontario, which is sixteen miles distant, was plainly reflected on the sky; a steamer, large sailing vessels, and the waves were plainly visible.

Mirages were also reported to have been observed at the following places: Henry, Dak., 1st; Webster, Dak., 4th, 18th, 23d; Reidsville, N. C., 15th; Vineyard Haven, Mass., 19th, 25th.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Fort Stanton, N. Mex.: on the 1st fires were reported in the Sierra Blanco Mountains.

Grand Haven, Mich.: a forest fire broke out about one mile south of station on the 25th and spread with great rapidity over an area about two miles in length. Fences and fruit trees suffered serious damage, and several farms and orchards were threatened with destruction. Fires also occurred on the same date in the woods west-northwest of here. The fires continued on the 27th to the south and north of this place, and men were employed in digging trenches from the lake to the burning districts for the purpose of checking the progress of the flames. On the 30th the forest fires south of the station were under control.

Forest fires are also reported to have occurred as follows: Fort Apache, Ariz., 15th, and Linkville, Oregon, 27th to 30th.

INSECTS.

Wadena, Wadena Co., Minn., 3d: reports from Perham, Otter Tail Co., state that grasshoppers have made their appearance in large numbers in that vicinity and have destroyed vegetation to a great extent.

Davenport, Iowa, 3d: farmers report that the chinch bug is causing much damage to the barley fields in Scott and Clinton counties.

Raleigh, N. C., 5th: grasshoppers and flea bugs are reported as destructive to the tobacco plants in this part of the state.

Owatonna, Steele Co., Minn., 7th: the chinch bug has injured the crops in this county.

Dover, Del., 8th: the rose bug is causing much injury to fruit and grain in this vicinity. Vineyards and orchards are covered with myriads of these bugs, and they have also in-

vaded dwellings. The potato bug has also damaged to a considerable extent the tomato fields in the vicinity.

The following is from "The Daily (Chattanooga, Tenn.) Times" of June 20th:

HARRISBURG, Pa., June 19th.—The entire lower portion of Centre county, Pa., is at present plagued by a most extraordinary visitation of snails or garden slugs. They come from the hiding places in crevices, under board walks, stones, etc., only at night, and they cover the roads and walks by the million. In Penn's Valley and Broomfield and the surrounding country they have eaten every growing thing in their path. Some gardens have been entirely destroyed. A letter from Penn's Valley says that on mornings after warm nights walks and roads are literally covered with the slum these insects leave in their trails and by bushels of dead snails that have been crushed by pedestrians and wagons. Lime, Paris green, salt, and other insect destroyers have been scattered liberally where the snails travel and feed, but they have no effect on them. The singular part of this plague is that no insects of the kind were ever known to be in the county before. Where they came from or what influences have brought them there so suddenly and in such immense numbers is a mystery no and has been able to solve.

Charleston, Coles Co., Ill., 26th: chinch bugs are destroying Indian corn in some places. During the earlier part of the month the potato crop was injured by potato bugs.

East Portland, Multnomah Co., Oregon, 30th: caterpillars are destroying the foliage of apple trees; some orchards have been almost ruined.

Spartanburg, Spartanburg Co., S. C., 30th: grasshoppers are reported to be very numerous.

Swartz Creek, Genesee Co., Mich., 30th: insects have done serious injury to the wheat crop in this county.

La Crosse, Wis., 30th: chinch bugs have caused great damage in this section; the corn crop has escaped serious injury.

METEORS.

Nashua, Hillsborough Co., N. H.: at 8.42 p. m. on the 15th a meteor was observed in the western sky, just above Jupiter; it shot downward towards the south or southeast and exploded when at an altitude of 15°, showing red, white, and green colors.

Des Moines, Iowa, 16th: a large meteor fell last night upon the farm of Ollie Botelson, who lives not far from what is known as Pilot Mound. So rapid was its descent that the roar was almost deafening. A beautiful trail of light was seen in its wake, which illuminated the earth for many miles and lighted up the scene as would a bright moonlight.

Keeler, Inyo Co., Cal.: a brilliant meteor of dark bluish tint was observed at 12.35 a. m. on the 17th; it was first seen at an altitude of 40°, azimuth 45°, and passed in a parallel line to azimuth 88°, being visible about seven seconds. Several meteors of minor brightness were observed in the southwestern sky between midnight and 1 a. m.

Fort Maginnis, Mont.: a very large meteor was observed at this station at 11 p. m. of the 18th; it passed almost entirely across the sky from southeast to southwest.

Corpus Christi, Tex., 21st: a large meteor was observed at 9.45 a. m. in altitude 50° and azimuth 20°; it disappeared beyond the horizon in azimuth 10°. The color of the meteor was whitish-green, and it appeared about four times as bright as the planet Venus.

Meteors were also observed during the month on the following dates:

1st.—Charleston, Ill.; Fort Bidwell, Cal.

5th and 9th.—Fort Grant, Ariz.

12th.—Windsor, Ill.; Kalamazoo, Mich.; Elkin, Ky.; Evansville, Ind.

13th.—Riverside, Cal.; Springfield, Ill.

15th.—North Colebrook, Conn.; Cambridge and Dudley, Mass.; Nashua, N. H.

16th.—Windsor, Ill.; Dover and Egg Harbor City, N. J.

17th.—Tecumseh, Nebr.; Davenport, Iowa.

18th.—Butterville, Ind.; Charlotte, N. C.; Cleburne, Tex.; Middlebrook, W. Va.; Bishopville and Stateburg, S. C.

19th.—Cleveland and Jacksonborough, Ohio; Cleburne, Tex.

20th and 22d.—Cleburne, Tex.

23d.—Stateburg, S. C.

25th.—Concord and Nashua, N. H.

26th.—Yuma, Ariz.

27th.—Gardiner, Me.

28th and 29th.—Kalamazoo, Mich.

30th.—Pekin, Ill.

MIGRATION OF BIRDS.

Ducks flying northward.—Tatoosh Island, Wash., 5th.

Ducks flying eastward.—Fort Custer, Mont., 4th.

POLAR BANDS.

Polar bands were reported from the following stations:

Lead Hill, Ark., 1st, 15th; Archer, Fla., 1st, 4th, 5th, 7th, 9th, 11th, 21st, 24th; Stateburg, S. C., 3d; Prairie du Chien, Wis., 3d, 14th to 16th; Napoleon, Ohio, 4th, 11th to 15th, 19th, 20th, 22d, 24th, 25th, 27th, 28th, 30th; Sitka, Alaska, 5th; Gardiner, Me., 5th, 15th, 17th; Oakland, Cal., 10th; Wauseon, Ohio, 10th, 12th, 13th, 20th, 22d, 24th, 25th, 27th; Montrose, Colo., 12th; Riley, Ill., 14th, 27th, 29th; Wytheville, Va., 15th; Ninnescah, Kans., 17th, 21st; Nashville, Tenn., 24th; Beverly, N. J., 25th; Bowling Green, Ky., 27th; North Colebrook, Conn., 29th.

SAND STORMS.

Abilene, Tex., 5th: a sand storm, during which the wind attained a velocity of fifty-two miles an hour, began at this place at 6.40 p. m.; for three-quarters of an hour the air was filled with dust to such an extent that buildings only fifty feet away could not be seen. The dust extended to an elevation of about two hundred feet.

Atlantic City, N. J.: a heavy gale prevailed during the 14th; the weather was so dry that the wind caused the sand to form deep drifts, resembling snow drifts; at some street corners the sand accumulated to such a depth as to impede travel.

San Carlos, Ariz., 26th: a violent sand and dust storm set in from the south at about 2.30 p. m. and continued for about one hour, the wind blowing at the rate of thirty-five miles per hour; a dense cloud of sand and dust enveloped everything.

Sand storms also occurred at the following places:

Rio Grande City, Tex., 2d: Fort McDowell, Ariz., 2d, 3d, 5th, 23d, 29th, 30th; Yuma, Ariz., 2d, 12th, 13th; Keeler, Cal., 5th, 13th, 18th; Fort Thomas, Ariz., 8th, 14th; Maricopa, Ariz., 22d; Fort Maginnis, Mont., 25th; San Carlos, Ariz., 25th, 29th, 30th.

SUN SPOTS.

Mr. H. D. Govey, of North Lewisburg, Champaign Co., Ohio, reports having observed sun spots on the following dates: 1st, 3d, 4th, 7th, 10th to 19th, 21st, 22d, 23d, 26th to 30th, or sun spots were observed on every clear day during the month.

The following report on sun spots is taken from the report of the "Illinois Weather Service:"

Mr. John W. James, observer at Riley, McHenry county, reports, as follows: "A very large spot came in sight on east limb of sun on the 5th, was on sun's meridian 11th, and disappeared, by the solar rotation, 17th; estimated diameter, 37,700 miles. A smaller spot appeared on east limb, morning of 26th."

VERIFICATIONS.

INDICATIONS.

The predictions for all districts east of the Rocky Mountains for June, 1887, were made by 2d Lieutenant F. M. M. Beall, Signal Corps, Assistant; those for the Pacific coast districts were made by 2d Lieutenant J. E. Maxfield, Signal Corps,

Assistant; the verifications were determined by 1st Lieutenant Robert Craig, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant.

The detailed comparison of the tri-daily indications for June, 1887, with the telegraphic reports for the succeeding

thirty-two hours, shows the general average percentage of verifications to be 74.42.* The percentages for the different elements are: Weather, 75.67; wind, 64.10; temperature, 75.41.* By states, etc., the percentages are: For Maine, 70.67; New Hampshire, 70.31; Vermont, 67.86; Massachusetts, 71.40; Rhode Island, 78.57; Connecticut, 76.10; eastern New York, 71.63; western New York, 71.02; eastern Pennsylvania, 73.98; western Pennsylvania, 74.62; New Jersey, 77.03; Delaware, 75.62; Maryland, 76.88; District of Columbia, 77.50; Virginia, 79.51; North Carolina, 75.96; South Carolina, 75.70; Georgia, 77.50; eastern Florida, 75.06; western Florida, 83.60; Alabama, 76.79; Mississippi, 72.38; Louisiana, 72.79; eastern Texas, 80.62; Arkansas, 69.69; Tennessee, 70.67; Kentucky, 77.99; Ohio, 76.92; West Virginia, 78.93; Indiana, 77.63; Illinois, 74.29; lower Michigan, 72.19; upper Michigan, 63.21; Wisconsin, 74.87; Minnesota, 70.85; Iowa, 77.05; Kansas, 70.45; Nebraska, 71.64; Missouri, 71.52; Colorado, 76.77; eastern Dakota, 66.53; Washington Territory, 70.94; Oregon, 76.43; northern California, 85.18; southern California, 90.05.

There was one omission to predict, out of 8,352, or 0.01 per cent. Of the 8,351 predictions that have been made, seven hundred and thirty-three, or 8.78 per cent., are considered to have entirely failed; six hundred and five, or 7.24 per cent., were one-fourth verified; 1,580, or 18.92 per cent., were one-half verified; 1,537, or 18.40 per cent., were three-fourths verified; 3,896, or 46.66 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

Of the total number of signals ordered during June, 1887, it was practicable to determine the justification or failure of sixteen; of these, eleven, or 68.75 per cent., were fully justified

*In determining the general average percentage and the percentages for the different elements, the Pacific coast states have not been included.

both as to direction and velocity. But one on-shore signal was ordered and this was not justified; for northeasterly winds eight signals were ordered, all of which were justified; seven signals were ordered without regard to direction, and of these, three, or 42.86 per cent., were justified. No signals were ordered late.

In addition to the above, there were ordered at display stations three signals, the justification of which it was impracticable to determine.

LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for June, 1887:

The percentage of verification of weather and temperature signals for the month is as follows: temperature, 87.2; weather, 83.0; temperature and weather, 85.1.

The railway weather signals were verified as follows: Detroit, Grand Haven, and Milwaukee Railway, 84.3; Chicago and Grand Trunk Railway, 83.7; Port Huron and Northwestern Railway, 84.6.

The following is from the June, 1887, report of the "Minnesota Weather Service":

Verifications of weather signals for Minnesota were 79 per cent. for weather and 80 per cent. for temperature; for eastern Dakota, 78 per cent. for weather and 78 per cent. for temperature; for northern Iowa, 76 per cent. for weather and 89 per cent. for temperature.

The following is from the June, 1887, report of the "South Carolina Weather Service":

The percentage of verification of the weather and temperature predictions for the whole state was: for weather, 81.6 per cent.; for temperature, 92.6 per cent.

The following is from the June, 1887, report of the "Tennessee State Board of Health Bulletin":

The percentage of verification of the temperature and weather predictions during the month at Nashville and Clarksville were as follows: Nashville, temperature, 80.0 per cent.; weather, 73.3 per cent.; Clarksville, temperature, 100.0 per cent.; weather, 53.3 per cent.

STATE WEATHER SERVICES.

The following extracts are republished from the reports for June, 1887, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The average temperature for the month was about the normal, but a cool wave which passed over the state on the 14th did some little damage to the cotton plant in checking its growth and causing lice to attack the tender plant; no material damage, however, is reported from this cause.

The rainfall was well distributed over almost the entire state and has affected all crops, particularly corn, very favorably. All crops are reported as good and in better condition than for years.

Summary.

Mean temperature, 79° 8; highest temperature, 102°, at Fayette, Montgomery, and Mount Willing, on the 19th; lowest temperature, 48°, at Gadsden, on the 14th; range of temperature, 54°; greatest monthly range of temperature, 48°, at Gadsden and Mount Willing; least monthly range of temperature, 24°, at Tuscaloosa; mean daily range of temperature, 14° 3; greatest daily range of temperature, 43°, at Gadsden, on the 14th; least daily range of temperature, 0°, at Oswechee, on the 28th.

Mean depth of rainfall, 3.82 inches; mean daily rainfall, 0.127 inch; greatest depth of monthly rainfall, 8.91 inches, at Mobile; least depth of monthly rainfall, 1.28 inches, at Gadsden; greatest daily local rainfall 3.09 inches, at Mobile, on the 21st.

Average number of days on which rain fell, 8; average number of cloudy days, 8; average number of fair days, 14; average number of clear days, 8; warmest days, 18th and 19th; coldest days, 1st, 2d, and 14th.

The "Dakota Weather Service," under the direction of Mr. P. F. McClure, Commissioner of Immigration:

The normal temperature for the month of June in Dakota, as computed from the observations at stations of the United States Signal Service for seven years past, is 64° 7. The average daily temperature for June, 1887, has been warmer than usual, exceeding the normal by about 1°, and the average mean of the year 1886 by 4°, and the mean of 1885 by 5° 7.

The rainfall in Dakota during the month of June, covering a period of seven years from and including 1881, has averaged 3.42 inches. The present year we have had 3.23 inches, being 0.19 of an inch below the average, although but three of the years of the seven, viz., 1881, 1882, and 1885, have exceeded in the quantity of rainfall in June that of the season of 1887.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, director:

The month of June, 1887, was notable for its high temperature, excess of sunshine, and great deficiency of precipitation.

A drought prevailed from the 9th to the end of the month, broken only by light local showers in the northern and central divisions from the 18th to 20th, and in the southern division on the 24th and 25th. Showers were frequent from the 1st to 9th, the amount of rainfall during that period being more than double that of the remainder of the month. The average deficiency was three inches for the state, and the greatest deficiency for any section was from four to five inches for De Kalb county.

The mean temperature of the month was three degrees above the June normal, and is the highest June mean temperature recorded in the past thirteen years. The maximum temperature, 104° 0, was reported from the northern and southern divisions on the same date, and is the highest June maximum temperature on record. A cool wave swept over the state on the 23d, the daily mean temperature falling gradually from 82° 0 on the 20th, to 63° 0 on the 23d, and then rose gradually to 79° 0 on the 30th. Light frosts were reported on the 23d-24th, in the lowlands of the northern counties, doing little, if any, damage to crops.

A severe local dust storm was reported from the north-central counties on the 18th, and a correspondent from Montgomery county reports a regular cloud-burst on the 16th that surpassed in violence anything of the kind that has heretofore occurred in that section.

The percentage of sunshine averaged 10 per cent. above the June normal. The prevailing direction of the wind was from the southwest, and its maximum hourly velocity forty-eight miles, from the north, on the 9th. The average hourly movement of the wind was about seven miles per hour.

Temperature.—The mean temperature of the month for the state, 73° 4, was 3° 1 above the June normal for past thirteen years, and 1° 1 above the highest June temperature in the same period. The mean temperature of the northern division, 72° 0, was 3° 5 above the June normal for past ten years; of the central division, 73° 6, was 2° 1 above, and of the southern division, 74° 6, was 1° 8 above.

The month opened with a daily mean temperature of 60° 0 for the state, rising gradually to 75° 0 on the 4th, remaining in the seventies until the 16th, when it rose to 80° 0, remaining in the eighties for five days. A cool wave swept over the state at this period, causing a fall of 19° 0, the daily mean tem-

perature being 68°.0 on the 23d, when it again commenced to rise until it attained 79°.0 on the 30th. The extreme monthly mean temperatures reported were 67°.3 from Chicago, Cook Co., and 79°.2 from North Caledonia, Pulaski Co.

The maximum temperature reported during the month, 104°.0, was two degrees above the highest recorded in June for past ten years, and was reported from Oquawka, Henderson Co., and Benton, Franklin Co., on the 19th. The minimum temperature, 42°.0, was reported from Hennepin, Putnam Co., and Louisiana, Pike Co., Mo., on the 24th.

Precipitation (inches and hundredths).—The rainfall for the month was very light, the average for the state being 2.91 below the June normal for past ten years. Rain fell generally from 1st to 9th, but from the latter date to the end of the month there was a continued drought, broken only by light local showers in the northern division from 18th to 21st, and in the southern division on the 24-25th. More rain fell in the period from 1st to 9th than double that of the remainder of the month.

The average rainfall for the northern division, 1.61, was 2.78 below the June normal for past ten years; of the central division, 1.62, was 3.36 below, and of the southern division, 2.12, was 2.55 below. The averages for the three divisions and the state for the month are the lowest on record for June; that for the state being 1.34 below the lowest heretofore recorded (June, 1878). The average for the months April, May, and June, 1887, 7.23, is 4.93 below the ten-year normal for those months. The greatest monthly rainfall, 3.78, was reported from Albion, Edwards Co., and the least 0.00 (no rain) was reported from Decatur, Macon Co.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The temperature was considerably above the normal, while the range was comparatively small. The extreme for the state was from 39°.0, at Manzy, on the 24th, to 98°.0, at Mount Vernon, on the 20th, so that the extreme monthly range occurred between the 20th and 24th.

Precipitation was greatly below the average, about three inches for the whole state, and varied very much in different parts of the state, from one-tenth of an inch at Princeton to 5.98 inches at Columbia City. Notwithstanding this deficiency in the rainfall, the harvest has not suffered materially, and bids fair to be an average one. If any important crop has suffered it is potatoes, which is reported a total failure in some localities.

Thunder-storms were few and not very violent, and nearly all occurred during the first week of the month, as did nearly all the rainfall, also.

The "Iowa Weather Service," Dr. Gustavus Hinrichs, Iowa City, director:

June, 1887, was very hot and rather dry, fair to fine weather, with southerly winds or calms, prevailing.

The mean temperature of the air was three and a half degrees above normal. During the past forty-eight years June has but once been as warm (1840) and twice only been warmer still by two degrees, namely, in 1865 and 1873. The number of hot days was ten, fully three times the normal number. The middle decade was the hottest, being about eight degrees above the normal; the first decade was five and a half degrees above, but the last decade was cool, being nearly three degrees below normal.

The cloudiness was about twenty per cent. less than normal, and clear days were two and a half times as numerous as cloudy days. The dryness of the air was greatest on the 17th, when the relative humidity at 2 p. m. came down to twenty-eight per cent.

The total run of the wind was light. Southerly winds and calms prevailed at fully three-fourths of all observations taken. No destructive storms occurred. The squall of the 18th extended over northern and eastern Iowa locally, with heavy rain, thunder, and lightning.

The total rainfall at the central station was less than two inches, being only forty per cent. of the normal amount. In the state the rainfall was less than two inches along the Mississippi and in a belt extending from Buchanan and Linn counties westward toward the middle of Iowa; it was also less than two inches in the northwest. But in the north, west, and south the rainfall generally exceeded three inches, and reached over six inches in Kossuth, Pottawattamie, and Union counties.

The greatest relief from the drought came by the extended rains of the 20th, 29th, and 30th. The rain frequency for the entire state has been quite large, rain having fallen on twenty days. But most of these rains were very local, and locally even light; the six days of more general rain named did more good than the other fourteen days with local rains. On account of the many showers rainbows were remarkably frequent. At the close of the month only the northeast of Iowa is seriously behind in rainfall, and the early July rains have made up for it already. It will be seen that our June rains this year did not fail us in Iowa, though in the east, parts of central Iowa, and especially in the northeast, they were deficient in amount. If the ground had not been so dry from spring and last summer our June rainfall this year would have been quite satisfactory. One stroke of lightning killed sixty-five head of sheep near South Amana on the 18th. A man each was killed by lightning in Adams and Madison counties on the 20th while plowing corn. Light frost was noted on the 21st in the northwest and northeast, heavier on the 23d in the same localities. Very fine crepuscular beams were seen at sunset in eastern Iowa on the 14th, which were mistaken by some for a form of northern lights.

The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

June has been characterized by abundant rainfall, and by the rapid growth and maturing of all the crops. The weather has again been favorable to husbandry, and we may feel that Kansas has reason to rejoice in her prosperity.

Temperature.—In eastern Kansas the temperature has been about normal, but in the western part of the state the range has been lighter. The highest temperature reported was at Brookville, 109°, on the 20th. The lowest temperature was 44°, at Wilson, on the 1st. There was a period of high temperatures from the 11th to the 22d, and another hot wave prevailed in the last days of the month. The first week was the coolest period. It has not been too hot at any time for the active prosecution of all kinds of business.

Rainfall.—The rains prevailed generally throughout the state on the first three days of the month, also from the 8th to 12th, from the 23d to the 25th, and on the last three days. These rains have, in most cases, been accompanied by lightning and thunder. On the 24th, in the northeastern part of Montgomery county, a hail storm of considerable severity was reported, which destroyed crops so completely that farmers plowed up their grounds and replanted. No other destructive storm has been reported, which is a fact worthy of note in a month when tornadoes have been considered most likely to occur. We may further add that the rains fell for the most part in gentle showers and in a way to do the greatest benefit to the crops.

The dry part of the month, from the 12th to 24th, was favorable for securing the crops, and the wheat was all harvested in fine condition and is a fair crop. Oats were destroyed by chinch bugs, and have been harvested only for fodder in most cases. The corn has reached a high degree of maturity for the season, and seems now likely to make an extraordinary crop.

The previous deficiency of rain had rendered the ground very dry, and the rains of this month have been most timely to avert the failure to crops which must have resulted had the drought prevailed a few weeks longer.

The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

The temperature from the 1st to the 8th was slightly below the normal, and the precipitation was above the normal, with heavy rains on the 5th. From the 9th until the afternoon of the 17th the weather was hot and dry. Temperature recorded at many stations above 90° on the 17th. On the afternoon of the 17th a heavy thunder-storm occurred, accompanied by brisk winds. This storm was reported in twenty-two counties, and the time was recorded as from 3 p. m., the beginning, to 10.20 p. m., as the time of ending. Local showers occurred on the 18th, 20th, 21st, 22d, and 23d, and no rain is recorded as falling after that date, until the afternoon of the 30th. The temperature reached the minimum on the 24th to 26th throughout the state, and then began a steady rise which reached the maximum on the 28th, 106°.5, at Grayling, and continued high on the 29th and 30th. No rainfall is recorded in Allegan county after the 9th.

Temperature.—The mean temperature for June, 67°.5, is 4°.9 above the normal. The mean temperature for the Upper Peninsula is 61°.0; northern counties, 63°.2; central, 68°.8, and the southern, 69°.8. The mean temperature of the central and southern sections is 4°.4 above the normal.

The mean maximum temperature for the state is 91°.5; this is considerably above the normal, and the month is remarkable for the extremes of temperature. Highest temperature, 106°.5, at Grayling, 28th; lowest, 37°.0, at Charlevoix, 27th.

The mean of the minimum temperatures, 44°.9; mean range, 46°.6. The middle and latter part of the month record high temperatures. A cool wave passed over on the 24th to 26th, with light frost reported in Crawford county on the morning of the 26th.

Precipitation.—The mean rainfall for June, 2.67, is 1.13 inches below the normal. The mean rainfall, by sections, is as follows: Upper Peninsula, 2.72 inches, northern section, 2.36 inches; central section, 1.78 inches, and the southern section, 4.41 inches. It will be seen by these means that the heaviest rainfall was recorded in the southern counties, while the central counties received the lightest. The mean of the central and southern counties is 1.00 inch below the normal.

The southern section received a heavy rainfall from the 1st to the 5th. Adrian reports 3.05 inches on the 1st, and Buchanan reports a fall of 2.53 on the 4th. The heavy fall of rain on these days brings the precipitation of the southern counties up to the normal, while all other sections are below. The thunder-storm of the 17th was reported in twenty-two counties, from 3 p. m. to 10 p. m., and was preceded by high winds and some damage was reported. The rainfall from this storm was about the average, except in the southeastern part of the state, where heavy rain fell, and, with the brisk winds, "lodged" grain to some extent.

Winds.—The month has been remarkable for the absence of high or destructive winds. The mean total movement of the wind is 4,631 miles, or 154.4 miles per day. The maximum velocity of wind is reported at Mackinaw City, 47 miles, southeast, on the 17th. Local wind storms were reported at Hudson on the 8th and 20th, doing some damage to trees.

The "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month was notable for an abnormally high temperature and deficiency of precipitation in the southern counties. The frost on the morning of the 23d did some little damage to tender vegetation. For the week ending June 4th the temperature and precipitation were deficient; for the second week there was an excess of temperature and a lack of precipitation; for the third week there was an excess of temperature and precipitation; from the 18th to the close of the month the weather did not vary much from the average, so that

the crops were generally in a favorable condition, except in southeastern Minnesota, where the prospects are poor, as the rainfall for May and June in this locality has been only fifty per cent. of the average for these months.

Temperature.—The mean for the state is 68° 3; this is 2° 9 above that of 1886 and 4° 2 above that of 1885. The mean has varied from 2° 0 above the normal in the southeastern counties and over 3° 0 above in the Red River Valley to nearly 3° 0 below the normal in the neighborhood of Duluth, at which place the mean temperature is the lowest noted since 1876. At La Crosse the mean is the highest observed for June in fourteen years. Two well-marked cool terms occurred; these were on the 4th and 5th, and from the 23d to the 25th. The minimum temperature for the month was registered during the former of these periods at Grand Forks and Pokegama Falls, where it was 32° 0. Frosts were reported during both of these terms as far south as the forty-third parallel. The warmer periods of the month were the 6th and 7th, 14th to 17th, 28th and 29th. The maxima temperatures, as in the month preceding, and with few exceptions, were recorded in the northwestern and north-central counties. The monthly range of temperature for the state, which is 64° 0, is not as great as for the corresponding month of either 1885 or 1886; this range is the same as reported from Grand Forks. The lowest monthly mean temperature is 55° 4, reported from Duluth; this is over 10° 0 below that for stations a few hundred miles distant, and seems to be due to the cooler and denser air moving from the lakes toward the land, where the temperature was higher and above the normal, and the atmosphere consequently lighter and more expanded.

Precipitation.—This was generally deficient, except in the lower portion of the Red River Valley, where there was a slight excess. The average for the state is 3.84 inches; this is .70 of an inch more than in 1886 and .69 less than in 1885. The heaviest precipitation was in the northern portion of the state, while heavy local showers brought the amounts above the average at a few southern stations; notably is this the case at Red Wing and Rochester, where the fall was over five inches. In the southeastern portion of the state the total rainfall was 3.3 inches below the average of the corresponding month for fifteen years. This deficiency, together with that of the month preceding, makes a total deficiency of six inches for the two months. At Duluth the precipitation was 2.5 inches below the average and Saint Paul 1.9 inches below. The dates of general precipitation were the 1st, 3d, 7th, 8th, 11th to 14th, 16th, 18th, 20th, 27th, 29th, and 30th. Stations reporting over an inch of rainfall, with the dates and amounts, were: Pine River Dam, 30th, 1.08; Grand Forks, 16th, 1.82; Albert Lea, 12th, 1.08; Red Wing, 14th, 3.60; Rochester, 14th, 2.42; Park Rapids, 11th, 1.43, and 16th, 1.80; Northfield, 14th, 1.60; Delano, 14th, 1.17; Litchfield, 11th, 2.20; Morris, 29th, 1.25; Saint Vincent, 16th, 1.72; Moorhead, 29th, 1.36; Duluth, 17th, 1.41; Leech Lake, 1.05 on 16th and 17th; Pokegama Falls, 11th, 1.11, and 16th, 1.28; Lake Winnigoshish Dam, 17th, 1.08.

Winds.—The prevailing direction was from the southeast.

The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

Summary.

Mean temperature, 79° 0; the highest observed was 105° 0, at Okolona and Columbus; the lowest, 52° 0, at Jackson, on the 15th, and Batesville on the 24th; absolute range, 53° 0.

Average depth of rainfall, 4.34 inches; greatest monthly rainfall, 8.22 inches, at Biloxi; least monthly rainfall, 1.20 inches, at Batesville.

The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

The mean temperature for the past month has been 75° 9, which is 1° 2 above the normal at the central station. The highest temperature during the month, 95° 6, was observed on the 20th, and the lowest, 56° 3, on the 1st. The rainfall for the month was 2.29 inches, which is 3.19 inches below the average for Saint Louis. Rain fell on eight days during the month.

In the state the rainfall was heavy in the western and southwestern parts, while in the north and eastern parts along the Missouri and Mississippi rivers the fall was below the normal. The heaviest falls reported were: Houstonia, 10.07; Miami, 7.88; Sedalia, 7.83; Pleasant Hill, 6.55; Springfield, 6.32; Pro Tem, 6.07, and Leavenworth, 5.45 inches.

The highest temperatures in the state were 101°, at Pro Tem; 100°, at Miami and Louisiana; 99°, at Sedalia; 98°, at Troy, and 97°, at Mascoutah, Ill., and signal office at Saint Louis. The lowest temperatures were 40°, at Ironton; 42°, at Louisiana; 44°, at Steelville, and 48°, at Troy.

Observers report the crops in good condition generally. Wheat harvest about ended at the close of the month.

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

The rainfall for June was far above the average and came in time to save most of the crops that suffered so much in May from drought. Ten stations—New York, Philadelphia, Atlantic City, Dover, Paterson, Newark, South Orange, Somerville, New Brunswick, and Moorestown—show an average excess of 3.05 inches.

Seventeen stations report rain to have fallen on an average of ten days out of the thirty.

Eleven stations report an average of nine days on which the cloudiness was equal or exceeded eight on a scale running from 0 to 10. Atlantic City, Philadelphia, South Orange, and Clayton enjoyed the most sunshine.

The mean temperature at eleven stations, as compared with normals determined from past records of New York City, Philadelphia, Atlantic City, Dover, Paterson, Newark, South Orange, Readington, Somerville, New Brunswick, and Moorestown, shows an excess of heat received during June of six-tenths of a degree.

The most destructive storm of the month, which occurred on the 22d, traversed the state in a northeasterly direction and was due to the presence of areas of low pressure on the lakes which moved slowly into Canada. We first hear of the damage done in Delaware before it reached us, and then of the havoc displayed in New York and New England after. New Jersey received its share. The downpours in some sections of the state were without comparison the heaviest recorded in years. In one day the rainfall at Lambertville measured 6.91 inches. The thunder was loud and the lightning terrific. Damage inflicted was considerable. At Plainfield the lightning struck the steeple of St. Mary's Roman Catholic Church, on Liberty street, and shattered one of the large side windows. Mr. V. W. Nash's residence was struck. A wire bird-cage was twisted into an unrecognizable shape. A large barn near New Market, belonging to Randolph Giles, was struck and nearly destroyed by fire. At Newark, large trees were torn asunder and the side of a new house on Sixteenth avenue was blown down. At Morristown a house on Water street was struck and set on fire, and considerable damage was done at the railroad station to the telegraph wires.

The "North Carolina Weather Service," Dr. Charles W. Dabney, jr., of Raleigh, director:

Summary.

Temperature (in degrees).—Mean for June, 1887, 73.8; normal for June, 74.6; departure from the normal, -0.8; highest, 102.0, on the 20th, at Mount Pleasant, N. C.; lowest, 43.0, on the 13th, at Marion, N. C.; absolute range, 59.0; mean daily range, 21.4; highest on record, 102.0, occurred in 1874, at Norfolk, Va., and in 1887, at Mount Pleasant, N. C.; lowest on record, 43.0, occurred in 1887, at Marion, N. C., as far as known; greatest daily range, 37.0; least daily range, 6.6; warmest day, 27.5 above the normal, on the 20th; coldest day, 31.5 below the normal, on the 13th.

Precipitation (inches and hundredths).—Average for June, 1887, 4.24; normal for June, 4.41; departure from the normal, -0.17; daily average, 0.14; greatest monthly rainfall, 9.74, at Southport, N. C.; least monthly rainfall, 2.18, at Chattanooga, Tenn.; greatest local daily rainfall, 2.87, at Raleigh, N. C., on the 23d. Daily rainfalls (exceeding one inch): Raleigh, N. C., 2.87; Charlotte, N. C., 1.60; Wilmington, N. C., 1.78; Norfolk, Va., 1.12; Cape Henry, Va., 1.61; Knoxville, Tenn., 1.46; Southport, N. C., 2.06; Davidson College, N. C., 1.45; Salisbury, N. C., 1.70; Weldon, N. C., 2.07; Marion, N. C., 1.10; Mount Pleasant, N. C., 1.43; Lenoir, N. C., 2.40.

Winds.—Prevailing direction for June, 1887, northeast; average direction for June, southwest; highest velocity, thirty miles, from the southwest, on the 1st, at Chattanooga, Tenn.

Weather.—Average number of clear days, 11.7; average number of fair days, 12.1; average number of cloudy days, 6.2; average number of rainy days, 9.1.

Droughts.—Longest duration of: At Lenoir, N. C., from 7th to 19th, 13 days; at Reidsville, N. C., from 11th to 17th, 7 days; at Tarborough, N. C., from 12th to 21st, 10 days; at Marion, N. C., from 12th to 20th, 9 days; at Davidson College, N. C., from 11th to 20th, 10 days; at Salisbury, N. C., from 11th to 19th, 9 days; at Mount Pleasant, N. C., from 12th to 19th, 8 days; at Charlotte, N. C., from 24th to 30th, 7 days; at Southport, N. C., from 12th to 21st, 10 days; at Wilmington, N. C., from 12th to 21st, 10 days; at Raleigh, N. C., from 12th to 19th, 8 days; at Weldon, N. C., from 24th to 30th, 7 days; at Lynchburg, Va., from 12th to 19th, 8 days; at Norfolk, Va., from 24th to 30th, 7 days; at Cape Henry, Va., from 24th to 30th, 7 days; at Chattanooga, Tenn., from 12th to 20th, 9 days; at Knoxville, Tenn., from 9th to 20th, 12 days. Average number of days (longest duration of), 9.

Frost (light), 12th, 13th.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

The weather for June was remarkable for the high barometric pressure prevailing, and for high temperature and clear skies. The mean barometric pressure was 29.990 inches, our highest June mean. The five-year average is 29.968 inches. The highest reading, 30.453, and the lowest, 29.620, were both the highest recorded for June. The barometric range, .833 inch, was less than for any preceding year, except 1886, indicating a uniformly high pressure throughout the month.

The mean temperature was 71° 0. The highest June mean for any preceding year was 67° 5, in 1886, while the five-year average is 68° 3. The June normal for the state is 70° 36. The mean temperature for the northern section was 69° 3; for the middle section, 70° 5, and for the southern section, 72° 5.

The highest point reached by the thermometer was 102° 0 on the 20th, at Pomeroy, our highest June reading. The lowest was 38° 0 on the 24th, at Paulding; this is 4° 0 higher than any preceding June minimum. Fourteen days were reported as clear, and six only as cloudy.

The mean rainfall, 3.85 inches, was slightly below the average, which is 4.19. The June normal is 4.02 inches. The greatest rainfall reported was 6.67 inches, at Hudson, and the least, 1.69, at Washington Court House. The greatest rainfall recorded during one day was 3.37 inches at Napoleon on the 1st. There were also four records of over two inches in one day, on the 4th, 5th, and 7th, apparently from local storms.

Two heavy rains crossed the state during the first week, and a third on the 8th and 9th ushered in a week of clear weather. The northern section had light rains on the 17th, 18th, 19th; and on the 20th another general storm occurred, giving a moderate rainfall from the 20th to the 23d, when the month was finished with fair weather.

Summary.

Mean temperature, 71°.0; highest temperature, 102°.0, on the 20th, at Pomerooy; lowest temperature, 38°.0, on the 24th, at Paulding; range of temperature, 64°.0; mean daily range of temperature, 22°.6; greatest daily range of temperature, 45°.0, on the 27th, at Paulding; least daily range of temperature, 2°.5, on the 10th, at Napoleon.

Average number of clear days, 14.0; average number of fair days, 10.0; average number of cloudy days, 6.0; average number of days on which rain fell, 9.7.

Greatest number of days on which rain fell, 15, at Cleveland; least number of days on which rain fell, 6, at North Lewisburg and Sydney.

Mean monthly rainfall, 3.85 inches; average daily rainfall, .128 inch; average monthly rainfall for northern section, 4.21 inches; average monthly rainfall for middle section, 3.92 inches; average monthly rainfall for southern section, 3.40 inches; greatest rainfall, 6.67 inches, at Hudson; least rainfall, 1.69 inches, at Washington Court House.

Prevailing direction of wind, southwest.

"Oregon Weather Service," report prepared by B. S. Pague, Private, Signal Corps:

Temperature.—The temperature was below the normal throughout the state, especially along the coast. A warm wave extended over the state on the 22d, except in the southeastern counties, where it was felt on the 22d. Ashland reports the highest temperature, 103°. It was generally cool during the first half of the month, the lowest reported was 24°, on the 5th, at Linkville.

Rainfall.—The rainfall has been below the average in all parts of the state, except in the northeastern counties where it was slightly above the average. The most marked departure was at Astoria, where it was 1.15 inches below the average, and at Bandon, where it was 1.01 below the average. The seasonal rainfall has been above the average along the coast and interior valleys, except in Portland, where it was nearly normal, and below the average in the southern part of the state. The greatest excess was at Astoria, where it amounted to 15.27 inches. The greatest deficiency was at Lakeview, where it amounted to 4.37 inches. Rain fell on ten days at Portland, and on a less number of days at the other stations, the least number of days being at Bandon, where it fell on only three days.

Weather.—No general storm appeared during the month; the rainfall was in showers, and the prevailing weather was clear.

Winds.—The winds were generally northerly, except at Astoria where they were southwesterly, and at Lakeview where they were southerly. They were generally fresh, rather above the average in force.

Lakeview reports frost on the 6th, snow (in small quantities) on the 5th and 11th, and a thunder-storm on the 22d.

The "South Carolina Weather Service," Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

The noteworthy features of this month have been: 1st. The cool weather which occurred from the 12th to 14th. 2d. The unusually high temperature of the 19th and 20th; and 3d. The period of dry weather, which, with the exception of light local showers on the 10th and 11th, prevailed in all sections of the state from the 3d until the 20th.

A warm wave occupied the state on the 9th and 10th, and during those dates the maximum temperature at several stations reached or exceeded 100°. On the 9th the maxima were as follows: Chester, 103°; Blackville, 102°; Jacksonborough, 100°; Saint George's, 100°; Bennettsville, 99°; Brewer Mines, 98°. On the 10th they were: Saint Matthew's, 102°; Hampton, 101°; Jacksonborough, 100°; Saint George's, 100°; Winnsborough, 99°; Bennettsville, 99°; Chester, 99°; Allendale, 99°; Yemassee, 98°.

During the hot wave of the 18th to 20th the maximum temperature at many of the stations reached 100° on three successive days.

The mean temperature for the month has been, notwithstanding the high maxima for the three days referred to above, slightly below the normal. At Charleston the mean temperature was 77°.4, or about 2° below the mean for the last sixteen years. In the central and upper counties the difference is slight.

The rainfall has been less than the average in all sections of the state. At Charleston it was 4.54 inches, which is 1.12 inches less than the average rainfall for June, as determined from records of the past sixteen years.

The month as a whole has been favorable to farming operations. The absence of rain enabled farmers to harvest successfully the small grain crops. Corn began to suffer for rain, but the abundant and timely showers which occurred during the last decade of the month prevented any serious damage.

Summary.

Mean temperature, 77°.9; highest temperature, 107°, at Bennettsville and Hampton, on the 20th; lowest temperature, 44°, at Kingston, on the 18th; range of temperature, 63°; greatest daily range of temperature, 47°, at Spartanburg and Hampton, on the 14th; least daily range of temperature, 6°, at Brewer Mines, on the 11th, and at Charleston on the 26th.

Mean depth of rainfall, 3.53 inches; greatest monthly rainfall, 5.72 inches, at Newberry; least monthly rainfall, 1.13 inches, at Bennettsville; greatest daily rainfall, 3.12 inches, at Winnsborough, on the 23d; least daily rainfall, trace (amount inappreciable), at Charleston on the 2d, and at Columbia on the 19th, 21st, and 27th. Average number of rainy days, 8.1.

Copious rains occurred in the upper and middle counties on the 1st and 2d, and from the 20th to the 23d. In the lower counties the heaviest rains of the month occurred during the period from the 25th to 27th, inclusive.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The special meteorological features for the month of June were the high temperature about the 19th and 20th, the severe local hail storms, the abnormally small amount of precipitation, and the small percentage of cloudiness.

The mean temperature was 73°.4, the highest for the past five years, except in 1885, when it was 74°.6. The highest temperature reported was 100°.0 on the 19th and 20th, and was 2°.0 above the record of the five preceding years. The lowest was 45°.0, recorded on the 25th, although from most of the stations in the state the minimum was recorded on the 1st and 2d. This was the lowest reported during the past five years. It was reported from the Cumberland plateau, one of the most elevated stations in the state. The range of temperature was several degrees more than that previously reported.

The mean rainfall was 2.77 inches, by far the smallest amount for June in many years. It was about an inch and a half less than in 1885, and four and one-half inches less than the mean for June of last year, which was abnormally great. At many places in the state the rainfall was the least recorded in many years. At Memphis and Nashville it was the least June rainfall since the establishment of the Signal Service observations in 1871, and at Chattanooga it was the least since 1879. Of the amount the eastern division received an average of a little more than two and a half inches, the middle division about three inches, and the western division about two and a half inches. The rains were, for the most part, light and local in their character and badly distributed, only a few being general, notably those of the 1st, 3d, 6th, and 21st. During the first decade rains were frequent, but during the second decade there was scarcely any rain in the state, a few stations in the central part reporting light showers, and most of them inappreciable. The greatest rainfall was 5.30 inches, reported at Savannah, and the least was only 1.04 inches, reported at Memphis, about one hundred miles distant. The greatest local daily rainfall was 2.60 inches, reported on the 21st at Manchester. Perhaps the heaviest local rain of the month was at Lynnville, Giles Co., on the 19th. The days of the greatest rainfall were the 1st, 3d, 6th, and 21st, and of these the greatest was on the 1st. There were eight days on which no rain was reported in the state. While the drought during the second decade of the month was somewhat injurious to the growing crops, it was very favorable for the wheat and hay harvest, which progressed most favorably, and much was added to the yield, especially of the latter.

Summary.

Mean temperature, 73°.4; highest temperature, 100°.0, on the 19th, at Cookeville, and on the 20th, at Austin; lowest temperature, 45°, on the 25th, at Farmingdale; range of temperature, 55°.0; mean monthly range of temperature, 42°.5; greatest monthly range of temperature, 52°.0, at Hohenwald; least monthly range of temperature, 30°.0, at Covington; mean daily range of temperature, 18°.5; greatest daily range of temperature, 38°.0, on the 14th, at Farmingdale, and on the 20th, at Hohenwald; least daily range of temperature, 3°.0, on the 1st, at Florence Station; on the 3d, at Ashwood; on the 11th at Covington, and on the 28th, at Beech Grove; mean of maximum temperatures, 95°.8; mean of minimum temperatures, 58°.3.

Average number of clear days, 13.8; average number of fair days, 10.5; average number of cloudy days, 5.7; average number of days on which rain fell, 8.6.

Mean depth of rainfall, 2.77 inches; mean daily rainfall, 0.092 inch; greatest rainfall, 5.30 inches, at Savannah; least rainfall, 1.04 inches, at Memphis; greatest local daily rainfall, 2.60 inches, on the 21st, at Manchester.

Days of greatest rainfall, 1st, 3d, 6th, 21st; day of greatest rainfall, 1st; days without rainfall, 12th, 13th, 14th, 15th, 16th, 17th, 23d, 24th.

Warmest days, 19th, 20th; coldest days, 1st, 2d.

Prevailing winds, westerly.

NOTES AND EXTRACTS.

OCEAN FOG PREDICTIONS.

[By Sergeant E. B. GARRIOTT, Signal Corps.]

In articles in the MONTHLY WEATHER REVIEW relative to this subject it was shown that the fog of the Banks of Newfoundland was caused by warm air

from over the Gulf Stream blowing over the cold surface of the ice-fields and Arctic currents; it was also shown that the cyclonic areas which passed over and from the North American continent were the agents whereby the intermingling of these masses of warm and cold air was effected.

In treating of the fog which develops over the ocean west of the sixtieth meridian and north of the thirty-fifth parallel, it will be necessary to consider, not only the influence of the ocean currents, but also the air which is blown from over the land. With the fact ever prominent that the intermingling of warm, humid air and cold or chilled air is necessary to fog development, it remains to determine how this contact may be brought about.

In the case of Newfoundland fogs it appeared that the ocean currents and ice-fields afforded the means whereby the air overlying them was warmed or chilled. In the vicinity of the coast in more southern latitudes the ocean currents still continue important agents in the development of fog. The Gulf Stream flows about northeast from the thirty-fifth parallel, and the normal condition of the air overlying its surface is warm and moist. To the westward of this warm current, and closely following the coast, a cold ocean current flows southwestward. The differences in temperature of air overlying these currents are not, ordinarily, sufficiently great to cause fog precipitation, and abnormal conditions are, therefore, required for its development. These conditions would exist with the contact between warm, moist air blown from over the Gulf Stream and cold air from over the continent, and to develop them it would be necessary to have a continued flow of air from the ocean, attending the wind circulation in the eastern quadrants of a low barometer area, intermingle with the cold air from over the land to the northward following its passage. The element of warm, moist air would thus be collected within the eastern half of a cyclonic area and the cold air would flow southward west of the storm-centre, the point of contact being in the southern quadrants. Under these conditions the development of fog might be expected to continue until the intermingling masses of air had established a uniformity in temperature and direction of the air currents in any given locality.

Observations of fog observed off the coast of North America in the vicinity of the fortieth parallel show that its development closely follows the passage of low barometer areas, and continues during the presence of the succeeding areas of high barometer, or until the passage of the high areas has allowed the winds to assume their usual westerly direction.

In summing up the above conclusions, which are verified by a large number of special fog reports rendered by shipmasters, it will be seen that the conditions necessary to fog development in the region referred to are a steady and continued south to east flow of air from over the ocean, closely followed by a flow of cold, northerly winds from the land, by means of which the differences in temperature requisite to fog precipitation are occasioned. Fog predictions could, therefore, be safely based upon the movement of areas of low barometric pressure of pronounced strength which left the continent between the fortieth and forty-seventh parallels. These areas would indicate in their passage across the continent the probable strength and continuance of the south and east winds from over the ocean preceding their arrival, and the fall in temperature which would accompany their departure from the coast, and allow of calculating the differences in temperature which would exist in the opposing currents, and the consequent likelihood of fog. These calculations would be necessary to the successful making of fog predictions, and as they are already considered in the official predictions of the Signal Service for the Atlantic coast states, they could be readily extended to the adjoining ocean.

It will be seen by referring to the statements in this series of articles, that the conditions favorable for fog development would, as a rule, exist almost simultaneously over the Grand Banks and over the ocean south of Nova Scotia, and off the coast of the United States in the vicinity, and to the northward, of the fortieth parallel. In the first named locality its development, being dependent upon winds from the south and east quadrants of a storm-area, would slightly precede that of more western longitudes, where its origin would attend the southward flow of wind through the western quadrants of a low barometer area. It is therefore evident that westward bound steamships encountering fog, in its earlier development over the Banks, would, in a majority of instances wherein the cyclonic conditions were well defined, experience fog west of the sixtieth meridian.

PECULIARITIES OF FROST FORMATION.

The following communication upon this subject is from an observer of the Signal Service:

ROSEBURG, OREGON, June 13, 1887.

The CHIEF SIGNAL OFFICER, U. S. A.,
Washington, D. C.

SIR: On page 91 of the MONTHLY WEATHER REVIEW for March, 1887, a report from the voluntary observer at Manatee, Fla., relative to "queer streaks in which frost is appearing," is given, together with an explanation by the editor of the REVIEW.

Upon this subject, I have the honor to report that Mr. Godfrey, a very reliable gentleman, who has a ranch on the west bank of the South Umpqua, three-quarters of a mile due southwest of this office, reports that on May 11, 1887 (I think the date a mistake, and that it was on May 12th), a peculiar frost occurred at his place among his potatoes and peas. The frost struck an occasional hill, a frost-bitten hill here, another there, and the same way throughout the two patches.

The frost did not confine itself to a single row, nor to a succession of hills in a single row, but it dotted the entire two patches. The potatoes are distant from the peas about one hundred and fifty yards due south, and an orchard separates them. The potatoes have the orchard on the north, some high weeds separate it from the river on the east, the south is unprotected, and the west is open ground, where a range of hills, five hundred feet high, protect

the entire ranch from westerly winds. The potatoes are in a nearly level (no undulations) piece of ground, about fifty yards long and ten yards wide, extending in rows from east to west, with a slight rise of ground in almost the centre about two feet higher than at either end; the soil is sandy. Rains were frequent during the early part of May, and Mr. Godfrey is of the opinion that the surface was cultivated, during the rainy period of the first part of the month, previous to the frost. The moisture appeared to be evenly distributed. Trees protected the potatoes on the immediate north and bushes on the east. No relation seemed to exist between the frosted and unfrosted parts in relation to trees or bushes, as the frost dotted the entire patch. There does not appear to be any underground springs.

The peas are in rows, running north and south, about the same sized patch as that of the potatoes, all conditions the same, except that the soil surrounding the peas had not been cultivated at all, the orchard being in the south, the east some bushes, the north unprotected for one hundred yards or more, and on the west some thirty yards is his residence. The slope of the peas is from south to north; except the slight slope the ground is level, no undulations. The condition, quality, color, and constitution of the soil in both patches are the same.

I personally examined the field, and deduced the above from Mr. Godfrey's remarks and my own observation.

The occurrence was peculiar, and a solution of the problem would be interesting, inasmuch as the frost was so irregular in its action.

Very respectfully, your obedient servant,

B. S. PAGUE,
Corporal, Signal Corps.

SOIL TEMPERATURE AND MOISTURE.

By MILTON WHITNEY, Superintendent of the North Carolina Agricultural Experimental Station, Raleigh.

(Reprinted from "The Bulletin of the North Carolina Department of Agriculture.")

Our work, commenced last year, on the temperature and moisture of the soil, still gives promise of yielding interesting and valuable results. We believe we will be able to establish an important relation between these factors of plant growth and cotton production that may prove of considerable practical value to agriculture. Before publishing the results in detail we wish to collect more data and make further observations on the cotton soils. A comparison of the results obtained in our cotton field last year, in June, and for the same period this year, will be of interest, especially if studied in connection with the monthly report of the condition of the crops as compiled by the department, and the weekly "Weather-crop Bulletin" issued by the Chief Signal Officer from Washington. These weekly bulletins state briefly the general condition of the weather, with its departure from the normal as regards temperature and rainfall, and also whether it has been generally favorable for the crops, the latter information being gathered mostly from a large number of farmers throughout the country, who send in special weekly reports.

After a long time at such work it is probable that they will be able to tell by glancing at their temperature and rainfall data whether the weather has been favorable for certain crops at certain periods of time. But this can hardly be done now. For instance, it would be hard to tell by looking over their meteorological data now which had been the most favorable year in the past fifteen years for a large crop production. They will need to collect other data before they will be of the greatest benefit to the farmers and agriculture.

Six inches of rainfall a month, with a certain temperature, may mean a good season, or if the rain all came at once, followed by a succession of bright days, it might mean serious harm to the crops. In a green-house the amount of water given to a plant depends upon the temperature and upon the general appearance of the soil and plant. Every farmer can tell at a glance whether the weather is favorable for his crops, and whether his soil needs rain, without looking at the table of rainfall and temperature published by the Signal Service. His meteorological instruments will probably be his foot, with which he will knock the soil away and tell you that for such hot weather the soil is too dry for the growth of plants unless it is in the fall and the crops are ripening, when they will wish a dry soil, as a wet one will cause the crops to keep on growing, or "run to weed." Generally the farmers want plenty of moisture in the soil until the middle of July. Their crop production is not directly limited by the amount of rainfall, but by the moisture in the soil. The oasis in the desert owes its luxuriant growth of vegetation to the springs that come near the surface, as there is seldom or never rain.

Boussingault states that in one town in South America the inhabitants assured him they had had no rain in seventeen years. So, while we admit it is very important to know the rainfall, still, as the rain does not do the farmer any good until it enters the soil, it is very essential that the rainfall be studied below, as well as above, the surface of the ground.

On the study of the rainfall below the ground.

We found last year, in July, that we had fine growing weather for cotton when the soil contained 8 or 9 per cent. of moisture in the "fine earth," or about 170,000 to 290,000 pounds of water per acre in the top six inches. With this, and rather high temperature, cotton grew rapidly. It may be stated generally that, with a high temperature, the more moisture a soil contains within reasonable limits, the more favorable are the conditions for the production of "weed," while, with less moisture, the conditions are more favorable for the production of fruit. It must be remembered, however, that for good fruit production it is necessary to have well-developed plants, or sufficient "weed," and so the conditions favoring a good cotton crop will probably consist of a period favoring the production of "weed" for the perfect development of the

plant, with later a dry soil, favoring the production and early ripening of the fruit.

It is interesting, then, to compare the conditions of plant growth that existed last year with those of this year for the same period of time. When the soil temperature curves are used this comparison can be seen at a glance, but curves cannot well be reproduced in the "Bulletin."† Part of the data is given in the following table:

Week ending—	Mean temperature of the air and soil.					Pounds per acre of moisture in the soil.				Rain.		Condition of surface soil where sampled.
	Air.	3 inches.	6 inches.	12 inches.	24 inches.	6 inches.	12 inches.	18 inches.	24 inches.	Inches.	Pounds per acre.	
1886.												
June 4	71.5	74.0	73.2	70.6	67.3	323,263	328,779	411,446	423,232	1.2	271,152	Rained just before taking sample.
11	72.8	74.3	72.9	71.5	68.6	322,761	311,504	393,356	441,151	1.6	361,336	Too wet to work.
18	76.6	77.1	75.6	74.3	71.0	266,552	346,420	353,197	406,421	0.9	203,304	Very wet.
25	72.5	73.3	72.6	71.5	70.1	233,004	309,328	297,125	375,147	0.8	180,768	Fair condition.
July 2	72.9	74.1	73.4	72.9	71.3	437,109	393,177	390,752	486,448	2.45	553,602	Soil saturated.
1887.												
June 4	69.8	71.8	70.7	69.2	66.9	304,825	353,337	359,094	447,186	1.70	404,468	Very wet.
11	75.1	76.3	75.4	73.8	70.5	300,634	305,801	338,997	470,762	1.83	413,506	Do.
18	73.7	76.3	75.4	73.8	70.7	236,234	266,114	380,107	468,412	0.0		Good condition.
25	79.6	81.5	81.0	78.9	75.3	*	*	*	*	3.25	734,370	Very wet.
July 2	74.6	76.7	75.5	74.5	72.9	205,486	272,943	333,750	427,190	0.0		Fine growing weather.

NOTE.—One inch of water per acre weighs 225.6 pounds.

* The sample of soil for week ending July 25 was taken by mistake in part of the field with the clay subsoil twenty-two inches below the surface, so the results are not comparable with the others.

† A diagram, showing the curves here referred to, was furnished by Mr. Whitney, and is represented in this number of the MONTHLY WEATHER REVIEW as chart v, g. v.—C. S. O.

The figures for the moisture in the soil for last year are not exactly the same as given in the annual report, as they have been recalculated on a new basis. The average weight of our sampler full of soil was found for twenty samples, each, representing the 1st, 2d, 3d, and 4th six inches in depth of soil (two feet deep in all). Stones larger than one-fifth of an inch were sifted out, and from the remainder the weight per acre of air dry "fine earth" was cal-

culated. These weights for the different layers of our soil (a sandy loam, with clay subsoil, beginning eight inches below surface) are as follows: Top six inches, 1,809,084 pounds per acre; second six inches, 2,051,956 pounds per acre; third six inches, 2,033,273 pounds per acre; fourth six inches, 1,880,699 pounds per acre.

After taking a sample of soil, the per cent. of moisture in the "fine earth" is determined and calculated in pounds per acre on the above basis. The soil is under cultivation (in cotton), hence the comparatively small weight of surface soil per acre.

Conditions in 1887 compared with 1886.

Week ending—	Temperature of soil.	Moisture in surface soil.	Rain.
June 4	Lower.	Less.	More.
June 11	Higher.	Less.	More.
June 18	Lower.	Less.	Less.
June 25	Higher.	Less.	More.
July 2	Higher.	Less.	Less.

It will be remembered June, 1886, was considered an unusually wet month. There was recorded 4.8 inches of rainfall against 6.22 inches this year. Yet we have found less moisture in the soil this year than for the corresponding periods of last year, save for one period which could not be compared. This will help to illustrate our position in regard to the insufficiency of the data furnished only by the rainfall and air temperature records of the Signal Service.

Our records are confessedly incomplete. The moisture is simply what is found in the soil at the end of a period of seven days, and does not represent the mean amount in the soil, so the results will depend largely upon the distribution of the rainfall. Still, until our methods can be improved, the data we are collecting are of value. Why is it that with 1.42 inches more rainfall this June than last, the month has not been so "wet" this year as last? Our other records show that there has been much more sunshine, or 71.3 per cent. of possible sunshine in June, 1887, against 47.92 per cent. for the same period in 1886. The difference of 23.38 per cent. (almost half as much as was recorded last year) must represent a great deal of evaporating power from the sun. Besides this, we find the mean temperature of the soil notably higher for June, 1887, than for 1886, and this would show conditions favorable for evaporation, and probably, in this case, more favorable for plant growth.

Meteorological record of voluntary observers and Army post surgeons, June, 1887.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. (Fahrenheit.)				Precipitation.	Stations.	Temperature. (Fahrenheit.)				Precipitation.
	Maximum.	Minimum.	Mean.				Maximum.	Minimum.	Mean.		
<i>Alabama.</i>	°	°	°		<i>Inches</i>	<i>Indiana—Cont'd.</i>	°	°	°		<i>Inches</i>
Greensborough.....	94	65	78.3	4.29		Manzy.....	90	39	69.8	3.36	
Mount Vernon B'ks.....	99	60	79.6	6.17		Sunman*.....	90	50	74.4	3.55	
<i>Arizona.</i>						Vevay.....	95	51	73.4	1.98	
Huachuca.....	102	60	82.6	0.72		<i>Indian Territory.</i>					
McDowell, Fort.....	118	51	89.6	0.0		Gibson, Fort.....	98	55	76.5	1.93	
Mojave, Fort.....	117	50	89.5	trace.		Reno, Fort.....	96	54	76.7	4.38	
Tucson.....				0.36		Supply, Fort.....	95	53	75.5	2.96	
<i>Arkansas.</i>						<i>Iowa.</i>					
Hot Springs.....	98	66	76.6	1.98		Bancroft.....	93	40	70.1	5.44	
Lead Hill.....	101	50	76.3	6.07		Clinton.....	103	50	72.6	2.45	
<i>California.</i>						Cresco.....	93	50	70.8	2.40	
Alcatraz Island.....	68	48	55.8	0.05		Cedar Rapids.....	97	42	74.1	2.53	
Angel Island.....	90	50	62.1	0.10		Clinton.....	103	50	72.6	2.45	
Benicia Barracks.....	104	52	65.9	trace.		Des Moines.....	94	42	71.3	2.90	
Bidwell, Fort.....	96	33	61.7	0.97		Fort Madison.....	98	33	73.2	3.78	
Cahuenga.....				0.08		Humboldt.....	91	44	73.2	2.00	
Gaston, Fort.....	108	38	66.1	1.62		Independence*.....	90	53	71.7	2.90	
Mason, Fort.....	81	53	60.3	0.06		Logan.....	100	46	74.4	1.49	
Nicolaus.....	102	50	72.4	3.04		Monticello*.....	97	42	72.0	2.62	
Oakland.....	85	48	59.6	0.05		Mount Vernon.....	100	53	76.2	2.10	
Oroville.....	104	54	75.9	0.00		Muscataine.....	98	41	71.8	2.10	
Presidio of San F.....	79	44	58.2	0.00		Oakalosa a*.....	96	55	74.7	2.29	
Riverside*.....	99	47	71.3	0.00		Oakalosa b*.....	96	57			
Sacramento.....	100	42	68.8	trace.		<i>Kansas.</i>					
Salinas.....	78	50	58.5	0.00		Allison.....	106	56	73.8	2.27	
Santa Barbara.....	95	44	63.7	0.03		Belleville.....	97	69	82.3	5.55	
Willows.....	110	45	76.1	0.54		Elk Falls.....				2.36	
<i>Colorado.</i>						Emporia.....	95	47	75.0	5.80	
Alma.....	80	29				Globe.....	94	58	75.3	4.03	
Grand Junction.....	102	55	74.7	0.20		Hays, Fort.....	98	41	71.7	3.29	
Lewis, Fort.....	86	32	63.3	0.38		Independence.....	96	47	76.5	4.25	
<i>Connecticut.</i>						Manhattan.....	98	54	74.8	5.08	
Hartford.....	95	42	66.8	5.99		Marydale Farm.....	102	45	75.8	4.77	
North Colebrook.....	80	42	61.8	3.84		Ninnescah.....	104	50	77.0	1.60	
Voluntown.....	89	50		5.00		Riley, Fort.....	100	46	77.4	3.55	
<i>Dakota.</i>						Salinas*.....	103	57		5.01	
Abr. Lincoln, Fort.....	101	38	70.3	1.20		Wellington.....	99	54	76.3	2.43	
Henry.....	90	36	67.8	3.72		Wakefield.....	102	62	76.2	4.49	
Meade, Fort.....	98	38	68.3	1.76		West Leavenworth.....	97	53		11.35?	
Pembina, Fort.....	95	32	62.0	3.94		Wilson.....	101	44	75.0	2.73	
Randall, Fort.....	100	27	76.0	0.88		<i>Kentucky.</i>					
Richardson.....	97	45	50.2	2.26		Bowling Green.....	97	60			
Sisseton, Fort.....	91	33	67.6	5.82		Elkin.....	90	60			
Sully, Fort.....	102	43	72.8	2.36		Frankfort.....	98	46	73.4	2.40	
Totten, Fort.....	91	36	63.6	5.90		Harper's Ferry*.....	90	58	76.4	1.33	
Webster.....	96	39	69.0	3.09		Midway.....	96	46	73.9	0.85	
Yates, Fort.....	101	39	72.0	0.97		<i>Louisiana.</i>					
<i>District of Columbia.</i>						Grand Coteau.....	90	63	80.0	6.73	
Distributing reserv'r.....	93	58	75.1	3.50		Liberty Hill.....	92			4.30	
Receiving reservoir.....	94	56	74.5	4.59		<i>Maine.</i>					
Rock Creek bridge.....	94	60	76.4			Bar Harbor.....	91	40		2.58	
<i>Florida.</i>						Cornish.....	91	50	64.6	4.32	
Archer*.....	92	62	71.2	6.39		Gardiner.....	88	41	62.0	3.42	
Duke.....	94	63	76.4	5.22		Orono*.....	92	47	62.8	3.36	
Fort Meade*.....	94	70	82.0	8.08		<i>Maryland.</i>					
Limona*.....	93	69	79.2	10.29		Cumberland.....	90	50	69.6	3.87	
Manatee.....	95	68	82.8	10.88		Fallston*.....	89	54	68.6	5.14	
Merritt's Island.....	90	70	81.0	6.47		Great Falls.....	96	56	74.4	3.39	
St. Augustine, Fort.....	94	67	78.9	3.25		McDonogh.....	89	48	70.4	4.16	
Tallahassee.....				5.00		McHenry, Fort.....	91	55	72.2	5.31	
<i>Georgia.</i>						New Midway*.....	94	50	73.4	3.84	
Athens.....	97	52	75.0	4.09		Woodstock.....	93	44	70.0	3.78	
Forsyth*.....	101	66	79.7	3.06		<i>Massachusetts.</i>					
Milledgeville.....	100	57	79.0	1.47		Amherst.....	91	38	65.7	5.09	
<i>Idaho.</i>						Blue Hill Obs'y:					
Boise Barracks.....	97	38	65.0	1.71		Summit.....	90	45	62.7	2.74	
Sherman, Fort.....	87	38	59.5	2.50		Base.....	90	42		2.71	
Lewiston.....	98	39		2.99		Deerfield.....	91	40	66.1	5.81	
<i>Illinois.</i>						Dudley.....	92	43	66.2	2.78	
Collinsville.....	96	49	70.1	2.37		Fall River.....	88	43	63.0	4.18	
Charleston*.....	100	50	75.8	0.07		Heath.....	92	48			
Geneseo.....	98	50	74.2	1.39		Milton.....	89	42	61.3	2.24	
Mattoon.....	99	54	73.0	1.03		Somerset.....	94	44	68.1	4.03	
Pekin*.....	98	45	70.2	3.10		Taunton.....	95	41	64.0	3.81	
Peoria*.....	101	53	77.7	1.53		Westborough.....	95	40	67.4	2.88	
Riley.....	94	46	69.0	1.23		Williamstown.....	83	40	65.6	4.33	
Rockford.....	95	54	72.2	0.89		<i>Michigan.</i>					
Sandwich.....	100	59	75.1	1.77		Birmingham.....				2.91	
South Evanston.....	97	43		1.80		Brady, Fort.....	90	38	63.0	2.02	
Sycamore.....	95	53	69.5	1.12		Harrieville*.....	94	40	62.9	2.52	
Windsor.....	100	51	75.1	1.01		Hudson.....	92	41		4.99	
<i>Indiana.</i>						Kalamazoo.....	87	51	69.0	5.64	
Butterville*.....	96	56	75.4	4.67		Lansing.....	90	46	69.4	1.45	
Jeffersonville.....	95	51	75.4	1.93		Swartz Creek.....	94	41	67.8	2.05	
Laconia.....	100	50	75.0	3.43		Thornville*.....	92	50	74.2	2.37	
Logansport*.....	97	52	75.1	2.95		Traverse City.....	98	43	64.0	3.65	
Lafayette.....	94	48	72.3	1.97							

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. (Fahrenheit.)				Precipitation.	Stations.	Temperature. (Fahrenheit.)				Precipitation.
	Maximum.	Minimum.	Mean.				Maximum.	Minimum.	Mean.		
<i>Minnesota.</i>	°	°	°		<i>Inches</i>	<i>Ohio—Cont'd.</i>	°	°	°		<i>Inches</i>
Minneapolis.....	93	51	69.7	3.17		Tiffin b*.....	94	54	72.2	3.67	
Snelling, Fort.....	92	47	70.7	5.20		West Milton*.....	98	53	74.0	6.75	
<i>Missouri.</i>						Wauseon.....	92	45	69.2	3.55	
Springfield.....	88	45	70.9	6.65		Westerville.....	91	44	70.3	2.85	
<i>Montana.</i>						Yellow Springs.....	92	43	70.7	1.71	
Keogh, Fort.....	107	42	70.1	1.82		<i>Oregon.</i>					
Missoula, Fort.....	82	40	59.7	3.98		Albany*.....	98	50	61.5	1.21	
Shaw, Fort.....	86	33	60.0			Bandon*.....		45	54.1	0.47	
<i>Nebraska.</i>						East Portland*.....	90	46		1.06	
Brownville*.....	95	54	77.6	3.93		Eola*.....	92	49	58.1	0.89	
Crete.....	93	45	71.2	4.03		Klamath, Fort.....	94	24	57.0	0.35	
De Soto*.....	96	48	72.8	4.94		La Grande.....	86	36		2.90	
Fremont*.....	93	46	71.2	2.60		Mount Angel.....	97	52	61.5	2.29	
Genoa.....	95	45	72.1	5.79		<i>Pennsylvania.</i>					
Harvard.....	96	60		3.00		Altoona.....	94	46	71.7	3.90	
Hay Springs.....	92	39	66.3	3.60		Bethlehem.....	94	49	71.8	4.87	
Marquette*.....	97	58		7.22		Blooming Grove*.....	94	50	68.2	5.30	
Niobrara, Fort.....	97	40	72.5	2.14		Catawissa.....	89	46		4.45	
Robinson, Fort.....	95	39	71.7	0.72		Dyberry.....	89	40	66.1	3.91	
Sidney, Fort.....	99	43	70.2	1.21		Easton.....		58		6.10	
Tecumseh*.....	90	50	74.7	3.99		Fallsington*.....	90	54	68.5	4.28	
<i>Nevada.</i>						Franklin*.....	87	40	65.2	4.40	
Carson City.....	98	33	65.4	0.46		Germantown.....	88	58		7.40	
McDermitt.....	95	31	61.3	2.32		Meadville.....	88	60	76.0		
<i>New Hampshire.</i>						Phillipsburg*.....	88	52	68.5	5.90	
Antrim.....				6.32		Quakertown*.....	87	43	65.6	4.56	
Ashland.....				6.09		State College.....	89	45	68.2	3.65	
Belmont.....				5.01		West Chester.....	90	49	69.1	6.72	
Berlin Mills.....	94	38		4.33		Wilkesbarre.....	93	45	69.0	6.06	
Bristol.....				6.78		Wysox.....	88	56	68.0	2.03	
Concord.....	92	40	65.5	4.85		<i>South Carolina.</i>					
Lake Village.....				5.87		Aiken.....	101	52	79.5	3.99	
Nashua.....	94	39	65.0	3.34		Kirkwood.....				1.92	
Wier's Bridge.....				5.90		Spartanburg*.....	112	50	72.8	5.51	
Wolfborough.....				4.78		Statesburg*.....	99	52	76.2	2.10	
Woodstock.....				6.73		<i>Tennessee.</i>					
<i>New Jersey.</i>						Ashwood.....	96	55	75.0	1.26	
Beverly.....	94	56	70.2	5.64		Austin*.....	100	59	77.1	1.29	
Clayton*.....	94	49	69.8	7.62		Milan.....	99	49	75.0	2.66	
Dover.....	92	42	67.2	7.06		<i>Texas.</i>					

Table of miscellaneous meteorological data for June, 1887—Signal Service observations.

Stations and districts.	Elevation above level, feet.	Atmospheric pressure (in inches and hundredths).				Temperature of the air (in degrees Fahrenheit).										Winds.																	
		Mean actual barometer.	Mean reduced barometer.	Departure from normal.	Extremes.		Monthly mean.	Departure from normal.	Extremes.		Monthly range.	Daily ranges.		Mean relative humidity, per cent.	Mean temperature of the dew-point (degrees Fahrenheit).	Precipitation (in inches).	Departure from normal precipitation (in inches).	Total movement, miles.	Prevailing direction.	Maximum velocity.		Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.							
					Highest barometer.	Date.			Lowest barometer.	Date.		Monthly range of barometer.	Max.							Date.	Mean max.						Min.	Date.	Mean min.	Greatest.	Least.	Miles p. h.	Direction.
New England.																																	
Eastport	53	29.95	30.01	+ .10	30.42	1	29.55	16	0.87	62.6	— 0.7	74.3	61.9	41.6	6	46.4	32.6	24.3	30	7.4	4	80.3	47.9	4.21	+ 0.81	5.693	s.	30	ne.	4	9	122	7
Portland	99	29.90	30.00	+ .09	30.37	1	29.60	9	0.77	61.5	— 2.5	88.6	69.2	43.3	2	53.4	45.3	33.1	13	4.1	21	75.0	52.5	4.07	+ 0.67	5.439	s.	27	e.	23	14	7	13
Manchester	279	29.75	30.00	+ .07	30.38	27	29.67	9	0.68	65.6	+ 0.4	92.9	75.1	40.6	11	53.8	52.3	37.2	16	5.2	17	71.7	54.7	3.37	+ 0.40	3.283	nw.	80	e.	9	10	12	8
Mount Washington	6,279	29.90	30.00	+ .07	30.38	27	29.67	9	0.78	46.6	+ 2.6	67.2	51.7	33.0	18	40.8	34.2	24.9	9	5.3	38.7	43.1	9.78	+ 0.40	17.250	s.	18	e.	23	17	4	19	
Northfield	871	29.07	29.99	+ .06	30.35	11	29.67	9	0.68	63.0	+ 1.5	88.2	73.1	39.8	19	51.0	48.4	35.3	12	6.9	17	79.0	55.9	4.12	+ 0.81	5.167	e.	27	e.	10	10	7	10
Boston	124	29.89	30.02	+ .08	30.35	11	29.63	9	0.72	64.5	+ 1.5	89.0	73.1	47.5	1	57.0	41.5	27.5	16	6.4	5	71.7	54.2	1.98	+ 1.33	7.198	e.	32	ne.	14	5	8	13
Edgartown	14	30.02	30.02	.....	30.31	11	29.65	9	0.66	61.6	.....	80.2	67.5	45.5	15	55.8	31.7	22.3	13	6.7	5	.....	54.8	2.25	.....	.....	sw.	.....	.....	.....	.....	.....
Nantucket	14	30.02	30.02	.....	30.31	11	29.65	9	0.66	61.6	.....	80.2	67.5	45.5	15	55.8	31.7	22.3	13	6.7	5	.....	54.8	2.25	.....	.....	sw.	.....	.....	.....	.....	.....
Wood's Hole	23	30.04	30.05	.....	30.33	11	29.68	9	0.65	61.2	.....	76.1	68.7	46.8	12	54.7	29.3	20.3	12	6.5	24	84.6	56.4	4.03	.....	7.895	sw.	35	sw.	23	11	2	15
Vineyard Haven	23	30.04	30.05	.....	30.33	11	29.68	9	0.65	61.2	.....	76.1	68.7	46.8	12	54.7	29.3	20.3	12	6.5	24	84.6	56.4	4.03	.....	7.895	sw.	35	sw.	23	11	2	15
Block Island	27	30.00	30.02	+ .05	30.31	11	29.65	9	0.66	61.7	— 0.3	84.0	67.6	49.2	6	59.3	30.8	22.6	9	4.2	23	85.0	57.0	2.75	+ 1.35	.....	sw.	30	ne.	4	11	4	16
Narragansett Pier	107	29.91	30.01	+ .05	30.32	11	29.63	9	0.69	65.5	— 0.5	90.2	74.4	44.3	12	59.1	45.9	37.1	13	4.6	23	73.9	56.3	5.62	+ 2.43	4.234	s.	19	ne.	1	11	12	7
New Haven	47	29.97	30.01	+ .03	30.30	11	29.61	9	0.69	64.3	— 0.7	84.5	71.8	47.4	11	55.9	37.1	30.7	13	6.2	23	79.1	57.1	4.69	+ 1.30	3.354	s.	25	e.	1	10	5	15
Mid. Atlantic States.																																	
Albany	85	29.92	30.00	+ .04	30.36	27	29.69	17	0.67	69.0	— 0.4	93.5	76.6	51.5	11	58.7	42.0	32.5	30	10.2	21	68.7	57.2	2.99	+ 0.86	3.450	s.	21	se.	2	11	12	13
New York City	158	29.83	30.01	+ .04	30.32	27	29.64	9	0.68	68.2	+ 0.2	90.1	77.5	51.3	1	60.3	38.8	28.8	13	4.6	23	69.5	50.9	7.70	+ 4.44	4.541	se.	24	se.	14	11	6	15
Philadelphia	117	29.90	30.08	+ .04	30.33	27	29.67	9	0.66	70.9	— 0.1	93.1	77.5	53.2	11	62.0	39.9	29.0	13	7.0	23	66.6	58.0	6.81	+ 3.47	6.198	e.	30	e.	11	12	7	14
Atlantic City	13	30.03	30.08	+ .05	30.33	27	29.67	9	0.63	66.1	— 0.9	95.1	77.5	53.7	12	63.0	41.4	30.7	17	4.7	11	84.0	60.9	4.31	+ 1.08	6.265	sw.	33	ne.	11	10	6	16
Baltimore	45	29.97	30.01	+ .02	30.34	27	29.63	18	0.71	72.3	— 0.7	93.7	78.1	51.8	12	63.0	41.4	30.7	17	4.7	11	84.0	60.9	4.31	+ 1.08	6.265	sw.	33	ne.	11	10	6	16
Washington City	100	29.91	30.01	+ .03	30.34	27	29.63	18	0.71	72.1	+ 0.1	94.7	78.1	50.1	12	61.8	44.0	33.4	13	6.0	6	68.0	59.7	2.99	+ 1.51	3.377	s.	18	e.	1	10	8	12
Cape Henry	652	29.34	30.01	+ .03	30.33	29	29.68	18	0.65	71.0	.....	97.8	78.9	48.2	12	63.2	49.6	36.6	7	6.6	15	.....	61.7	2.81	+ 0.87	.....	ne.	.....	.....	.....	.....	.....
Lynchburg	30	29.99	30.01	+ .03	30.33	29	29.68	18	0.65	72.8	— 1.2	97.7	83.8	49.3	12	61.5	48.4	33.3	13	10.0	10	71.4	61.7	3.65	+ 0.12	2.004	ne.	24	s.	20	11	6	13
Norfolk	30	29.99	30.00	+ .03	30.30	29	29.64	18	0.66	73.1	— 0.9	95.5	78.1	55.5	16	64.7	39.0	28.1	17	6.6	11	74.8	63.5	2.72	+ 1.01	5.255	ne.	27	ne.	11	9	5	14
South Atlantic States.																																	
Charlotte	808	29.19	30.01	+ .02	30.30	29	29.75	18	0.55	75.2	+ 0.2	101.9	86.4	52.8	12	64.5	49.1	28.5	19	14.4	11	66.9	62.2	4.41	+ 0.54	3.068	e.	24	w.	21	10	6	15
Hatteras	11	30.03	30.02	+ .01	30.31	30	29.75	18	0.56	72.4	— 1.6	82.8	77.1	60.5	12	68.8	22.3	13.1	10	4.4	25	83.6	67.0	3.41	+ 1.30	10.589	n.	42	n.	11	9	8	11
Kitty Hawk	439	29.58	30.03	.....	30.34	29	29.75	18	0.60	72.7	.....	97.2	81.3	56.3	2	64.1	40.9	34.2	17	6.0	12	.....	63.7	4.31	+ 0.69	.....	ne.	.....	.....	.....	.....	.....
Raleigh	439	29.58	30.03	.....	30.34	29	29.75	18	0.60	72.7	.....	97.2	81.3	56.3	2	64.1	40.9	34.2	17	6.0	12	.....	63.7	4.31	+ 0.69	.....	ne.	.....	.....	.....	.....	.....
Southport	.....	.....	.....	.....	.....	.....	.....	.....	.....	70.1	.....	91.0	82.9	53.8	13	69.4	37.2	29.5	14	6.5	23	.....	.....	9.74	+ 6.43	.....	sw.	.....	.....	.....	.....	.....
Wash Woods	.....	.....	.....	.....	.....	.....	.....	.....	.....	73.4	.....	97.0	81.8	58.0	12	62.2	39.0	25.0	10	5.25	.....	.....	.....	4.11	+ 0.78	.....	sw.	.....	.....	.....	.....	.....
Wilmington	52	29.96	29.99	.....	30.26	29	29.73	18	0.51	75.5	— 0.4	97.9	84.4	53.0	13	66.9	44.9	31.0	14	7.7	23	71.4	64.6	6.41	+ 0.03	5.190	sw.	23	sw.	22	13	8	11
Charleston	32	29.97	29.99	.....	30.35	29	29.73	10	0.52	77.5	— 1.5	99.9	85.4	57.4	12	71.3	42.2	23.7	19	5.8	26	77.5	69.5	4.34	+ 1.12	6.799	sw.	24	sw.	29	13	7	10
Augusta	183	29.84	30.00	.....	30.25	30	29.75	10	0.50	78.9	+ 0.9	103.2	90.4	59.1	13	67.9	44.1	33.8	14	8.3	22	67.6	65.9	4.79	+ 0.38	2.939	ne.	19	s.	21	10	8	10
Savannah	87	29.94	30.00	.....	30.32	30	29.77	10	0.45	77.1	— 2.9	97.3	86.6	60.0	12	69.2	39.7	25.7	14	8.1	27	77.0	68.5	10.76	+ 3.74	4.933	e.	22	ne.	27	12	5	15
Jacksonville	43	29.98	29.99	.....	30.17	29	29.80	23	0.37	77.9	— 2.1	95.1	87.1	64.1	15	70.4	31.0	23.5	25	6.1	12	75.6	68.8	9.68	+ 3.99	4.908	ne.	28	s.	2	15	6	17
Florida Peninsula.																																	
Cedar Keys	22	29.96	29.96	.....	30.11	30	29.77	23	0.34	78.7	— 2.3	88.8	83.0	63.5	14	71.6	25.3	22.1	14	6.0	22	77.9	70.7	8.65	+ 1.57	5.862	ne.	24	sw.	23	11	11	5
Key West	22	29.96	29.96	.....	30.11	30	29.77	23	0.34	78.7	— 2.3	88.8	83.0	63.5	14	71.6	25.3	22.1	14	6.0	22	77.9	70.7	8.65	+ 1.57	5.862	ne.	24	sw.	23	11	11	5
Sanford	25	29.97	29.90	.....	30.10	29	29.78	23	0.37	77.6	— 4.4	87.8	79.7	64.4	14	70.9	30.4	20.7	9	5.6	12	78.9	72.8	8.22	+ 4.26	5.563	e.	24	s.	10	17	7	15
Eastern Gulf States.																																	
Atlanta	1,129	28.88	30.01	— .01	30.26	30	29.78	23	0.48	75.3	— 0.9	97.0	85.8	57.1	13	65.9	39.9	30.0	14	8.5	11	62.8	61.0	7.34	+ 2.00	6.561	e.	28	e.	28	7	8	12
Savannah	30	29.96	29.95	.....	30.09	29	29.77	23	0.32	79.3	+ 0.7	99.0	85.5	64.9	15	72.7	44.1	33.3	15	5.1	22	73.3	69.4	14.11	+ 8.42	5.007	sw.	32	ne.	30	11	7	10
Mobile	35	29.96	29.95	.....	30.12	30	29.80	11	0.32	77.7	— 2.3	93.3	86.7	62.6	14	68.8	30.7	27.3	15	4.2	26	70.9	62.2	8.91	+ 3.36	5.083	e.</						

Table of miscellaneous meteorological data for June, 1887—Signal Service observations—Continued.

Stations and districts.	Elevation above sea level, feet.	Atmospheric pressure (in inches and hundredths).						Temperature of the air (in degrees Fahrenheit).										Precipitation (in inches).		Winds.				No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.						
		Mean actual barometer.	Mean reduced barometer.	Departure from normal.	Extremes.		Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.		Monthly range.	Daily ranges.			Mean relative humidity, per cent.	Mean temperature of the dew-point (degrees Fahrenheit).	Precipitation (in inches).	Departure from normal precipitation (in inches).	Total movement, miles.	Prevailing direction.	Maximum velocity.											
					Highest barometer.	Lowest barometer.				Max.	Min.		Mean max.	Mean min.	Greatest.							Least.	Miles p. h.					Direction.					
					Date.	Date.				Date.	Date.		Date.	Date.	Date.							Date.											
Upper Miss. Valley.																																	
Saint Paul.....	831	29.05	29.93	+0.01	30.22	28	29.63	16	0.39	72.9	48.3	4	59.8	41.3	28.5	5	5.5	12	73.7	60.1	2.07	—	3.21	3,910	se.	38	w.	18	8	5	18	7	
La Crosse.....	744	29.20	29.98	+0.06	30.34	26	29.72	17	0.62	71.1	44.2	24	60.6	48.9	33.8	25	12.2	4	65.2	57.4	0.98	—	3.96	5,241	se.	32	nw.	20	5	9	15	6	
Davenport.....	615	29.32	29.96	+0.02	30.29	26	29.73	17	0.56	73.0	50.7	1	62.4	46.3	29.0	28	12.8	5	64.0	58.6	1.66	—	2.87	4,793	se.	38	w.	18	10	5	13	10	
Des Moines.....	866	29.05	29.95	+0.01	30.24	26	29.74	18	0.50	71.9	45.0	2	61.5	48.8	34.7	2	8.0	10	67.4	59.6	2.25	—	4.82	4,106	se.	24	nw.	20	7	6	10	14	
Dubuque.....	665	29.27	29.97	+0.03	30.29	26	29.72	17	0.57	72.4	45.3	24	61.6	50.3	32.9	25	9.7	23	66.5	59.5	1.32	—	3.99	2,383	se.	22	nw.	18	6	7	11	12	
Keokuk.....	618	29.32	29.96	+0.03	30.26	26	29.78	17	0.48	72.8	50.1	2	63.0	45.1	28.4	19	13.5	23	66.8	59.9	1.55	—	3.88	5,205	se.	36	sw.	3	6	3	14	13	
Cairo.....	359	29.03	29.99	+0.01	30.19	26	29.75	17	0.44	75.0	54.3	2	66.5	41.4	33.7	27	3.4	6	70.7	63.8	2.34	—	2.21	4,180	se.	34	w.	9	9	8	13	9	
Springfield.....	644	29.33	30.00	+0.04	30.29	26	29.76	17	0.53	72.6	50.7	2	62.4	45.3	29.9	18	10.4	25	70.0	61.4	3.07	—	3.04	5,152	sw.	25	ne.	16	7	5	13	13	
Saint Louis.....	571	29.39	29.97	+0.02	30.24	26	29.75	17	0.49	77.3	57.2	1	68.8	39.8	22.9	21	9.9	25	58.8	60.7	2.54	—	2.58	4,864	se.	24	s.	4	8	5	12	13	
Missouri Valley.																																	
Lamar.....	1,028	29.09	29.95	+0.02	30.18	27	29.77	20	0.41	73.3	51.0	23	65.0	44.8	28.8	23	8.3	10	72.2	62.9	5.43	—	0.12	4,235	se.	20	se.	9	12	6	13	11	
Leavenworth.....	842	29.80	29.95	+0.02	30.34	27	29.77	20	0.41	72.4	49.1	1	63.6	44.9	24.8	5	9.9	10	68.4	60.4	4.56	—	1.59	5,822	se.	30	n.	20	10	10	13	7	
Omaha.....	1,113	28.80	29.96	+0.02	30.21	28	29.77	16	0.44	72.3	41.0	4	57.2	33.2	40.9	23	13.6	9	60.8	53.5	3.89	—	1.64	9,548	se.	72	sw.	26	10	3	20	7	
Valentine.....	2,614	27.23	29.87	+0.04	30.24	21	29.62	15	0.62	69.4	43.6	4	58.2	35.4	32.9	19	13.4	28	62.1	54.9	2.88	—	0.65	8,174	se.	42	se.	19	10	5	17	8	
Fort Sully.....	1,600	28.19	29.86	+0.06	30.17	21	29.55	15	0.62	70.6	37.6	4	58.1	39.5	35.7	17	7.9	10	65.5	56.2	3.98	—	0.16	8,631	se.	39	nw.	7	11	7	11	12	
Huron.....	1,307	28.53	29.90	+0.03	30.14	26	29.58	16	0.56	69.9	37.6	4	61.1	49.2	35.7	5	9.7	30	72.4	60.7	2.48	—	2.33	5,874	se.	28	se.	26	8	6	13	11	
Vankton.....	1,234	28.60	29.88	+0.04	30.13	28	29.59	16	0.55	70.8	44.7	1	61.1	49.2	35.7	5	9.7	30	72.4	60.7	2.48	—	2.33	5,874	se.	28	se.	26	8	6	13	11	
Northern slope.																																	
Fort Assinaboine.....	2,690	27.10	29.89	+0.01	30.29	21	29.50	12	0.79	63.0	36.6	3	47.8	30.7	36.2	12	10.1	4	61.2	45.8	3.33	—	0.83	8,642	nw.	48	w.	5	12	8	18	4	
Fort Custer.....	3,040	26.75	29.84	+0.02	30.34	21	29.54	25	1.00	65.5	39.1	2	52.2	26.3	39.8	25	12.9	7	55.9	46.6	0.97	—	1.83	6,223	se.	48	se.	12	11	5	16	9	
Fort Maginnis.....	4,320	25.54	29.88	+0.02	30.34	21	29.57	40	0.77	67.3	32.6	3	46.5	31.7	41.4	28	11.0	4	65.0	40.1	2.53	—	0.25	7,945	nw.	47	nw.	27	15	5	19	6	
Helena.....	4,069	25.77	29.86	+0.03	30.30	21	29.48	12	0.82	57.6	33.0	6	45.8	30.4	33.1	12	8.5	4	74.9	49.0	3.48	—	1.08	5,235	sw.	40	nw.	1	13	6	18	6	
Poplar River.....	2,002	27.76	29.84	+0.04	30.23	21	29.37	25	0.85	65.1	38.8	3	53.1	36.1	39.2	28	11.2	2	66.4	52.1	4.19	—	2.56	6,975	w.	52	n.	6	15	1	16	13	
Deadwood.....	4,600	25.37	29.92	+0.03	30.28	21	29.66	20	0.72	63.4	39.8	3	52.7	32.6	29.2	29	13.4	3	67.8	51.8	2.16	—	1.77	7,456	sw.	34	n.	25	9	4	19	7	
Cheyenne.....	6,105	24.02	29.83	+0.07	30.24	22	29.58	5	0.66	64.2	34.0	3	50.3	35.6	4	37.6	23	18.4	21	39.7	39.7	0.80	—	0.71	7,788	se.	44	n.	32	7	6	11	13
Fort Laramie.....	2,841	27.03	29.89	+0.03	30.25	21	29.63	6	0.62	69.2	39.8	4	53.3	37.9	50.4	17	17.6	7	.....	59.0	0.98	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Platte.....	2,841	27.03	29.89	+0.03	30.25	21	29.63	6	0.62	70.4	49.0	1	59.7	45.0	35.7	13	11.4	28	69.9	59.0	3.20	—	0.31	8,153	se.	36	n.	20	7	3	17	10	
Middle slope.																																	
Denver.....	5,294	24.71	29.78	+0.05	30.17	22	29.49	6	0.68	72.4	43.7	4	54.6	32.2	40.8	17	13.7	8	43.8	43.2	0.53	—	1.04	5,934	se.	42	n.	23	5	2	19	9	
Pike's Peak.....	14,134	17.97	29.89	+0.09	30.09	21	29.26	20	0.36	69.3	20.6	5	49.8	33.2	19.5	26	4.4	1	73.6	28.2	1.44	—	0.40	13,290	sw.	74	sw.	6	15	3	15	12	
Las Animas.....	3,899	25.68	29.78	+0.08	30.18	21	29.57	20	0.61	72.5	51.1	4	59.4	44.9	40.0	17	17.1	28	70.4	61.4	1.89	—	0.36	5,728	se.	36	ne.	7	6	4	15	11	
Concordia.....	1,384	28.48	29.90	+0.02	30.15	21	29.73	19	0.42	72.7	46.1	1	62.9	51.2	32.3	23	7.4	11	68.2	60.4	3.13	—	0.97	5,813	se.	38	n.	20	9	8	13	9	
Dodge City.....	2,523	27.35	29.99	+0.01	30.25	21	29.69	24	0.56	74.0	55.0	1	63.0	46.7	32.2	17	13.6	3	64.1	59.4	4.00	—	0.84	7,648	se.	28	n.	3	10	6	12	12	
Fort Reno.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	75.6	53.5	1	63.5	41.4	.....	.....	.....	.....	.....	.....	4.64	—	1.73	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fort Supply.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	76.8	58.2	4	65.0	23.7	36.1	8	12.2	11	.....	.....	4.18	—	0.14	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fort Elliott.....	2,700	27.20	29.83	+0.03	30.07	21	29.60	24	0.47	73.6	57.3	21	62.9	30.9	31.3	22	17.6	2	66.6	60.7	2.39	—	1.60	8,007	se.	38	se.	6	8	4	14	12	
Southern slope.																																	
Fort Hill.....	1,200	28.72	29.92	+0.01	30.10	28	29.68	1	0.43	76.5	60.2	1	68.9	36.8	26.3	22	9.2	30	71.3	66.1	3.69	—	0.24	6,761	se.	40	sw.	5	9	4	13	13	
Ahlone.....	1,748	28.13	29.87	+0.03	30.06	22	29.57	10	0.49	77.3	60.4	2	68.6	41.1	32.6	1	12.8	13	59.4	61.4	3.26	—	0.12	7,948	se.	52	se.	5	8	3	16	11	
Fort Davis.....	4,928	25.16	29.84	+0.04	30.01	21	29.60	1	0.32	73.7	55.4	4	62.8	37.9	30.9	4	17.3	23	45.5	48.4	1.17	—	1.07	4,784	ne.	30	sw.	5	9	2	11	17	
Fort Stanton.....	6,150	23.58	29.77	.....	30.08	21	29.58	1	0.44	64.5	42.6	5	51.7	46.9	39.8	5	15.7	29	61.0	49.2	2.50	—	0.81	3,345	se.	33	sw.	2	11	2	9	19
Southern plateau.																																	
El Paso.....	3,764	26.16	29.77	+0.04	30.97	21	29.61	24	0.36	74.9	52.0	3	66.5	49.0	38.0	3	22.5	27	43.2	53.2	0.46	—	0.03	3,240	se.	25	ne.	9	5	0	7	23	
Lava.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	78.8	46.2	10	61.0	67.1	.....	.....	.....	.....	.....	.....	0.64	—	0.01	.....	.....	.....	.....	.....	.....	.....	.....	.....
Santa Fe.....	7,026	23.39	29.85	+0.03	30.13	21	29.69	1	0.44	65.6	46.0	10	55.5	37.5	31.5	11	12.0	3	42.7	39.4	0.60	—	0.56	2,228	sw.	25	se.	30	9	1	15	14	
Fort Apache.....	5,020	24.98	29.82	+0.04	30.02	30	29.65	24	0.37	71.9	39.3	15	56.8	36.2	75.8	16	28.2	27	34.7	38.1	1.70	—	0.80	6,362	sw.	36	se						

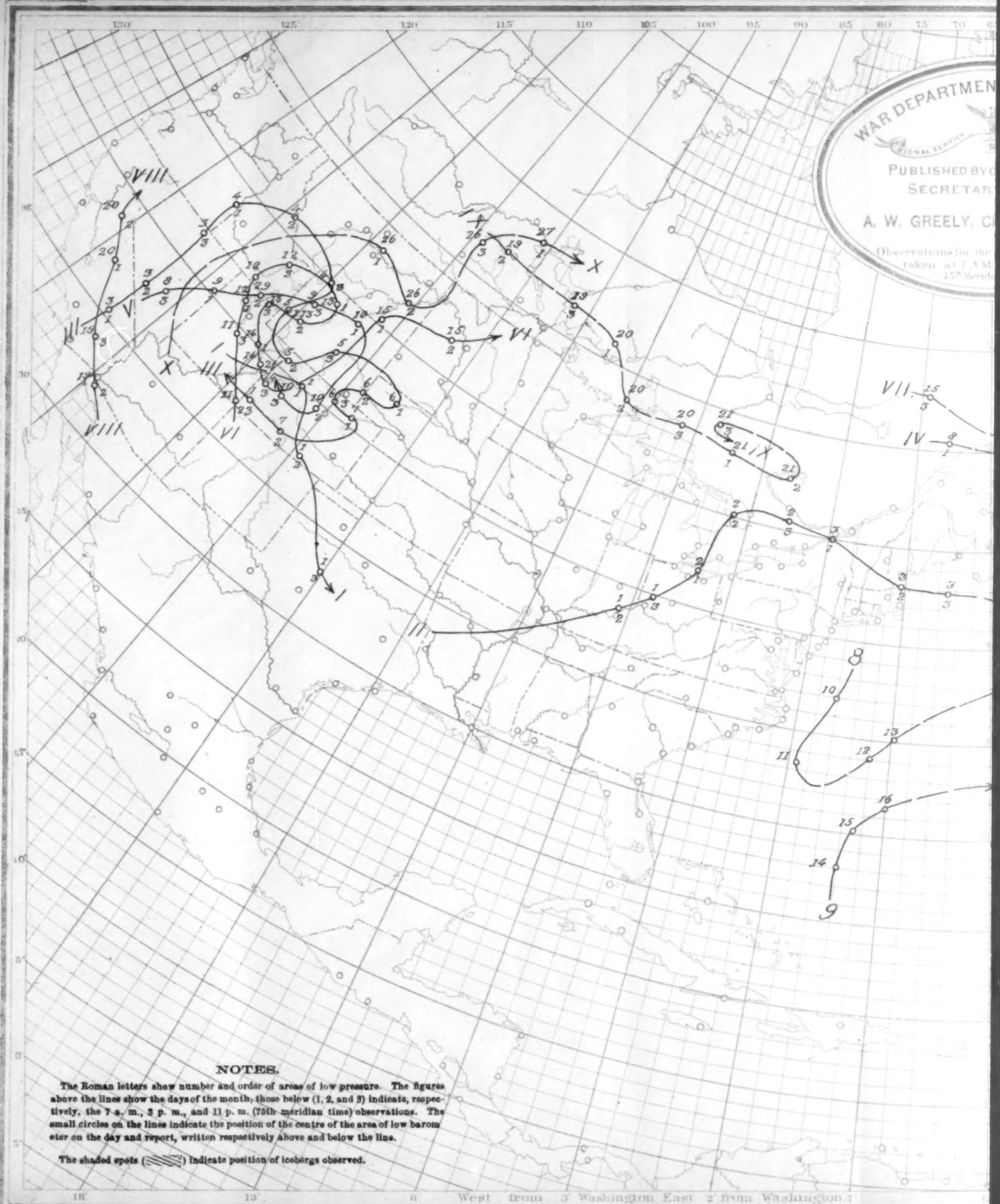
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Chart I. Tracks of Areas of Low

Form 106 G 1884



of Areas of Low Pressure. June, 1887.

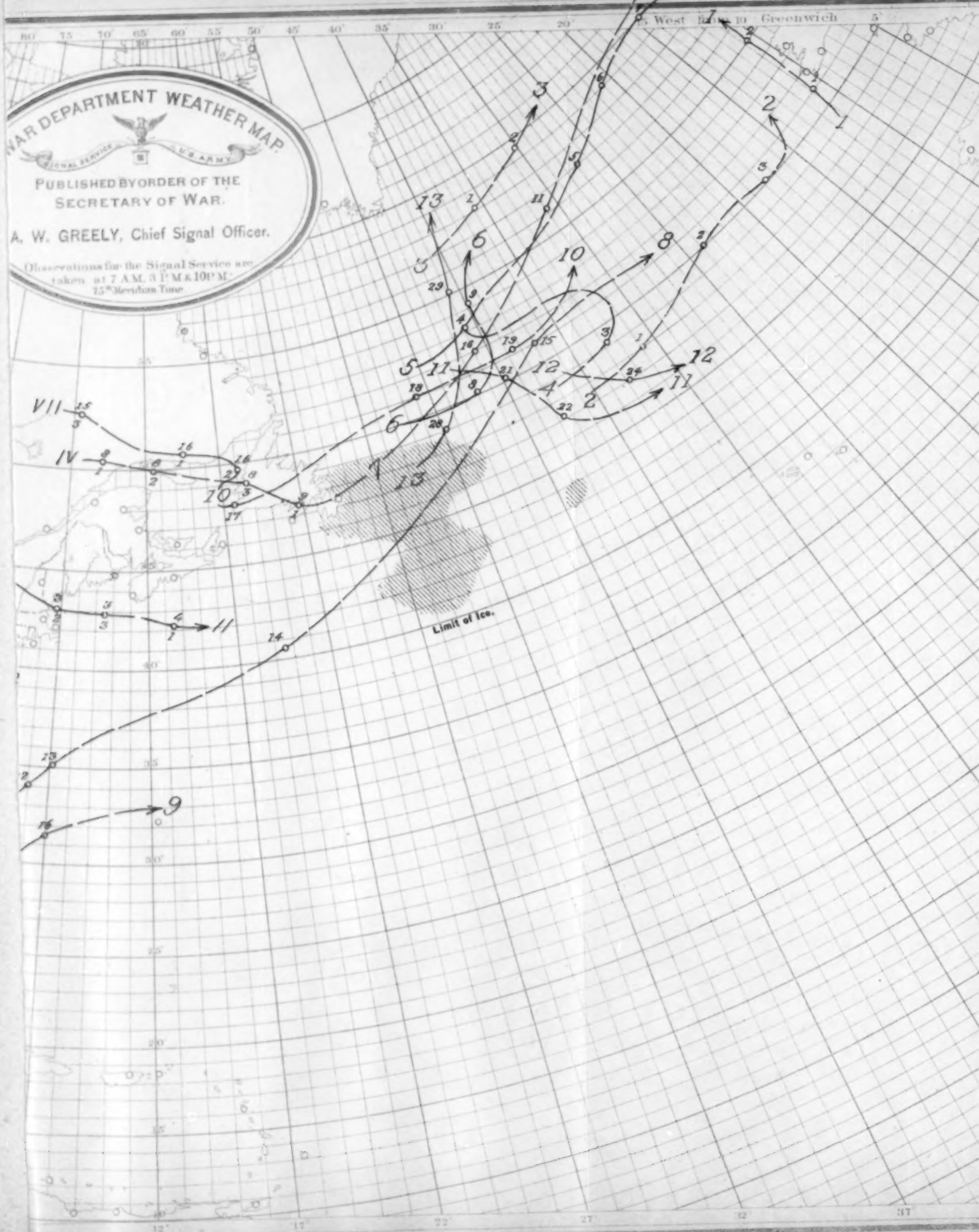






Chart II. Isobars, Isotherms, and Winds, June, 1887.

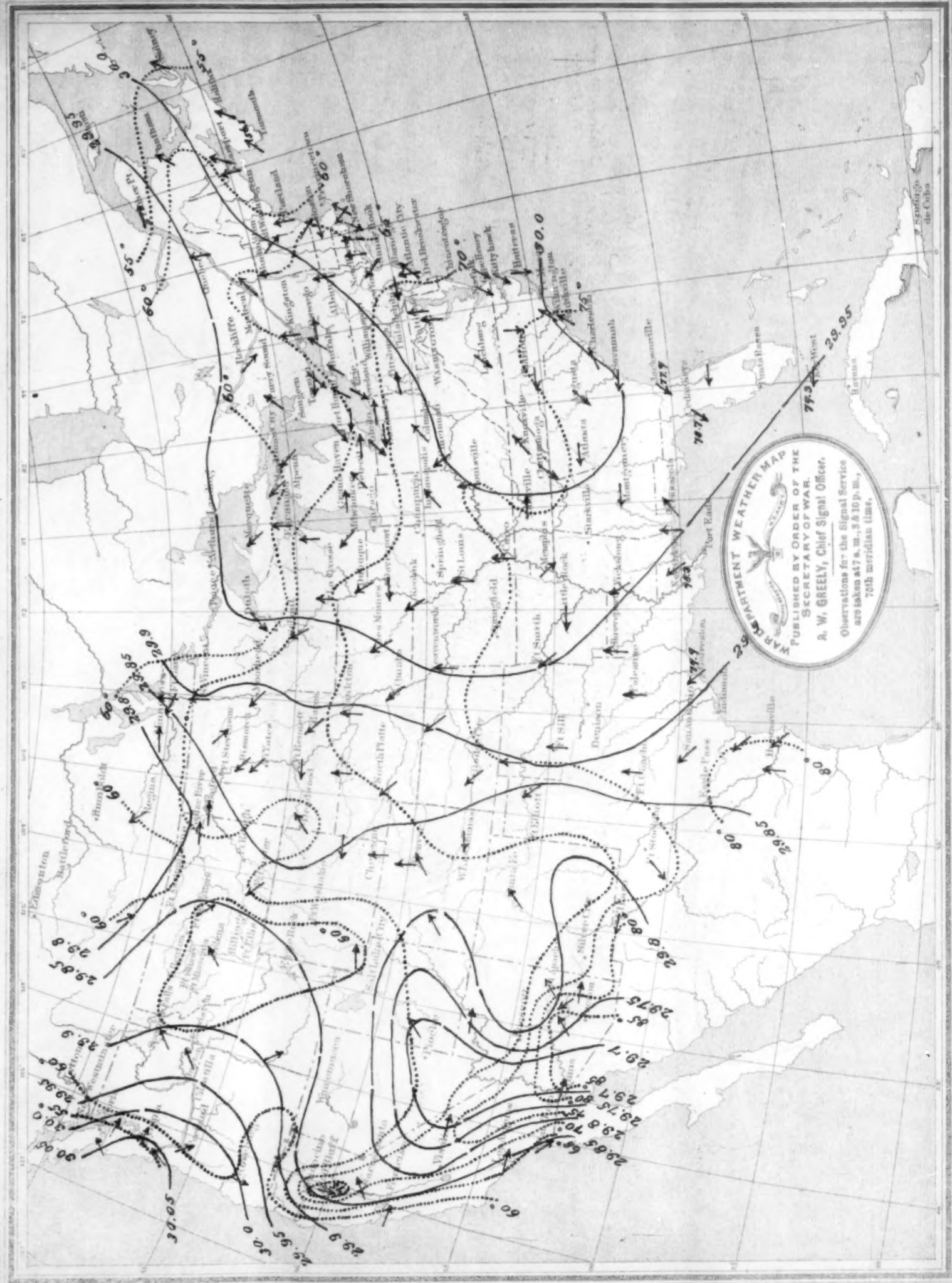
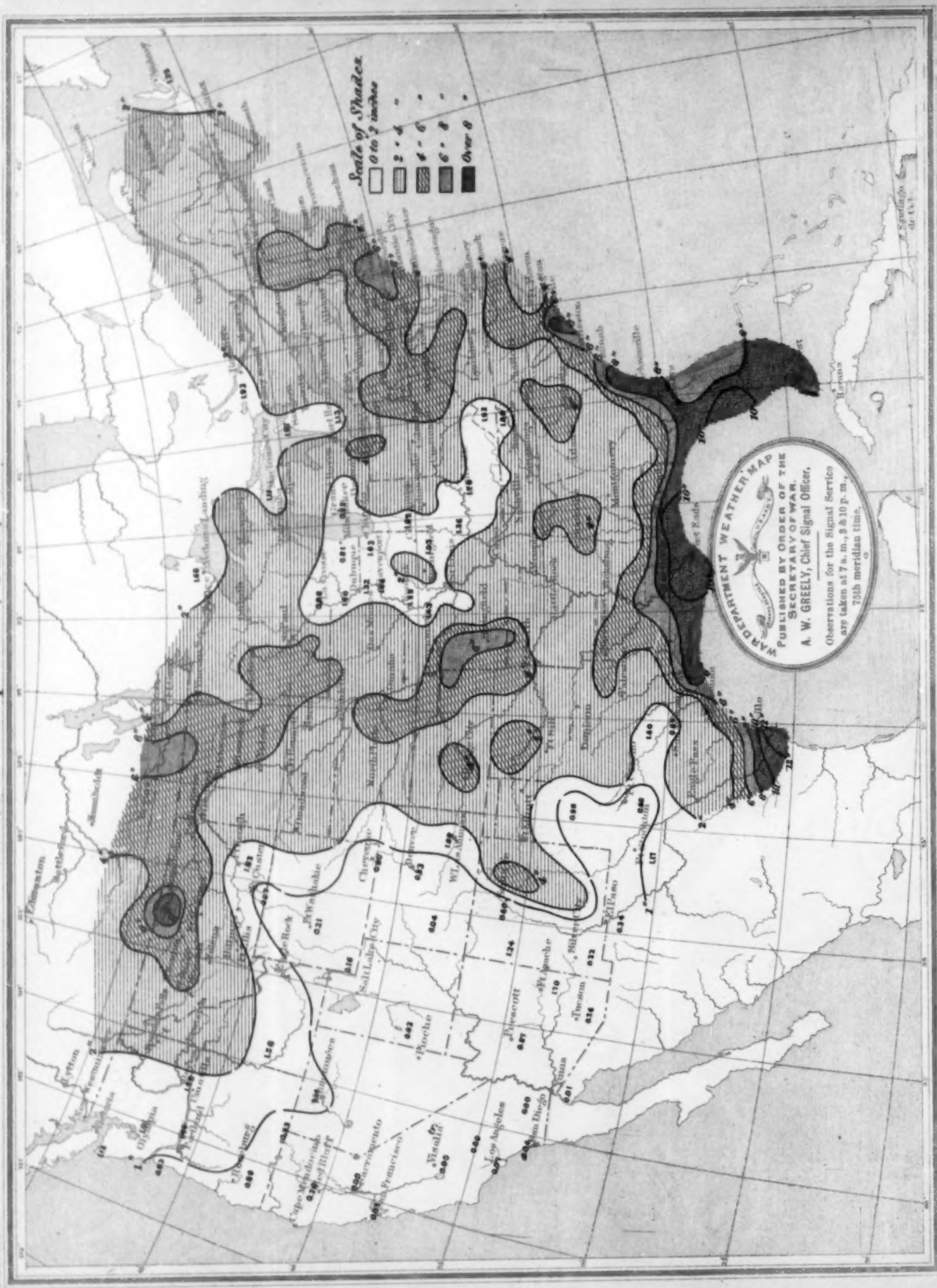


Chart III. Precipitation, June, 1887.

Form 106 F.



Signal Office, Wash.

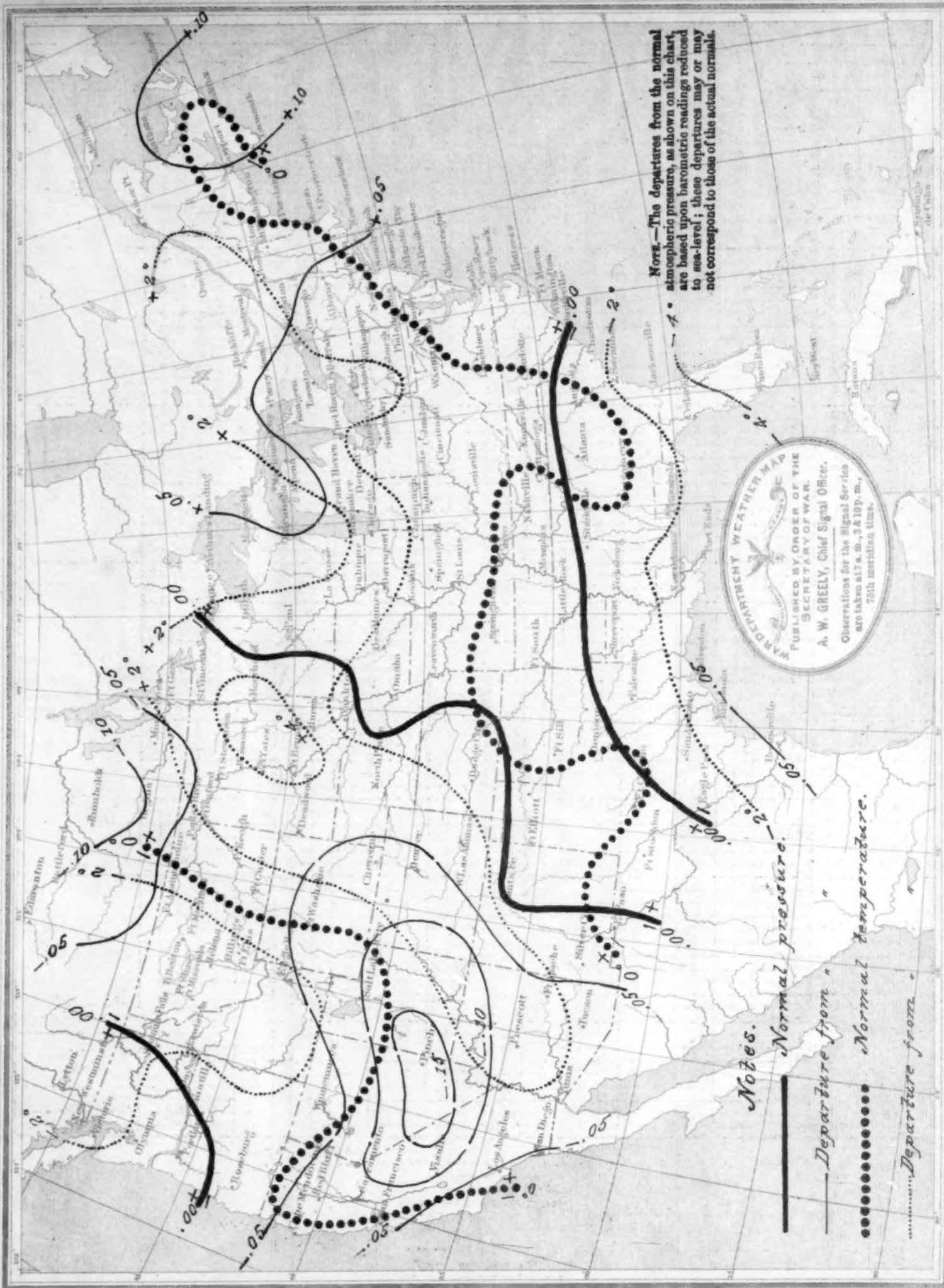
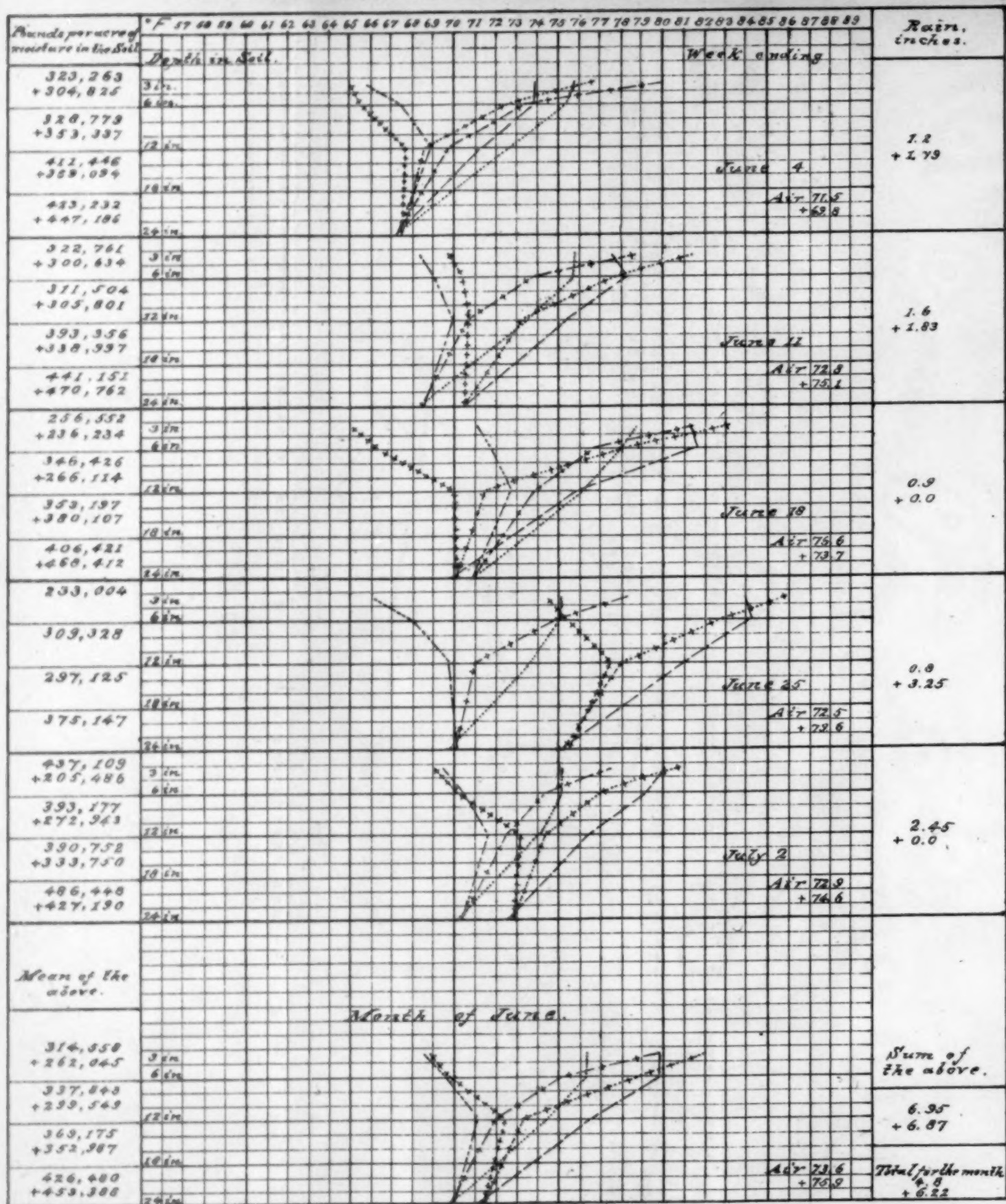


Chart V. Soil temperature and moisture of June, 1886 and 1887.

Observations taken at Raleigh, N. C., by Milton Whitney. See report under "Notes and Extracts."



Per Cent of possible sunshine June { 1886 — 47.32.
1887 — 71.3.

References:

----- 7 A.M. }
 - - - - - 1 P.M. } 1886.
 7 P.M. }
 7 A.M. }
 - - - - - 1 P.M. } 1887.
 7 P.M. }
 + Refers to 1887.

Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for June, 1887.

Observer and place of observation.	Observer and place of observation.	Observer and place of observation.	Observer and place of observation.
Alexander, S., Birmingham, Mich.	Deming, H. D., Wellsborough, Pa.	Lincoln, A. T., Marion, Va.	Slade, Elisha, Somerset, Mass.
Anderson, Dr. W. W., Stateburg, S. C.	Downing, A. L., Concord, N. H.	Lips, Miss Clara, Manitowoc, Wis.	Sonedecker, Rev. T. H., Tiffin, Ohio.
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Dazey, J. B., Charleston, Ill.			

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for June, 1887.

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